



# BEANS-BEANS EVERYWHERE!

Grades: K-3

Subjects: Literature, Science, Reading, Writing  
Montana Standards: Literature 1-5, Science 1-5,  
Reading 1

Approximate Time: 2-30 minute classes &  
ongoing

*Objectives:* Students will

- Have a knowledge base of plant life and how beans grow.
- Practice creative writing based on knowledge and imagination.
- Sample Montana “Cowboy Beans”

*Materials Needed:*

- *Jack and the Beanstock* by Paul Galdone (or other author)
- Lima beans
- Potting soil
- Resealable bags
- Writing paper and pencils
- “Cowboy Beans” recipe
- 2 pounds pinto beans
- 2 pounds ham hock
- 2 onions, chopped
- 4 Tablespoons sugar
- 2 green chilies (or to taste)
- 1 can tomato paste

*Keywords:*

Dry beans, Lentils, rotation,  
climate, garbanzo beans, pinto  
beans

*Brief Description:*

Beans are one of the crops grown in Montana. The south central and eastern parts of Montana have the best climate for growing beans. Of the beans grown in Montana, Garbanzo ranks 3rd in the nation, Lentils - 4th in the nation, Dry Edible Peas - 4th in the nation, and the most common is Pinto Beans - which ranks 7th in the nation in production.

In 2002, 13,500 acres of pinto beans were planted in Montana. When beans are grown, especially pinto, good irrigation is necessary. Most farmers grow at least two types of crops, so they are able to rotate crops each year. (Crop rotation is alternately planting a crop each year, which helps in soil revitalization.) Common rotated crops are mustard, peas, lentils, pinto beans, barley and canola. The peas use less moisture than wheat, and they also fix nitrogen from the air, which becomes available the following year to the next crop. Rotation with legumes reduces costs by eliminating the need to add nitrogen to the soil.

*Lesson:*

1. Read and discuss the story Jack and the Beanstock
2. Discuss what plants need in order to grow.
3. Introduce students to beans in Montana.
4. Have students plant a lima bean in a resealable bag filled with soil.

5. Based on the story Jack and the Beanstock, have the students use their imagination and write one sentence about how their beans will grow (tall, fast, enormous, etc.) Give them the sentence starter “My bean will grow...”
6. At a science area, plant and label beans growing under a variety of conditions such as, no light, no soil, no water, light only, etc.
7. Ask groups of students to keep written observations of different growing conditions. Ask students to write a short paragraph on the results of their plant growth.
8. Make and sample “Cowboy Beans.”

Discussion Questions:

1. What environmental conditions do most plants need to grow?
2. What would you like your plant to grow into?
3. What do most plants need to grow?
4. Do you think all seeds need the same conditions to grow into a healthy plant? Why or why not?
5. How can we improve the conditions so that plants have a better growing environment?

Related Activities:

1. Read related books about how plants grow. (The Tiny Seed, From Seed to Plant)
2. Look at the part of a bean plant under a microscope.
3. Draw and label the parts of a plant.
4. Plant a variety of seeds and chart the similarities and differences.

## **Cowboy Beans**

(\* recipe of cook John White of the N Bar Ranch in Montana. This was one of the cowboy's favorite dishes)

2 pounds pinto beans  
2 pounds ham hock  
2 onions, chopped  
4 tablespoons sugar  
2 green chilies (or to taste)  
1 can tomato paste

Wash the beans and soak over night. Drain, place in a Dutch oven and cover with cold water. Add remaining ingredients and simmer until tender. Sample the beans while cooking. Add salt to taste and water as needed.

# THE WONDERFUL WORLD OF CHERRIES

Grades: K-3

Subjects: Science , Music, and Art

Montana Standards: Science 1-5, Art 1,  
Music 1

Approximate Time: 45-60 minutes

*Objectives:* Students will

- of the nutrients in cherries
- of how cherries are used
- of a cherry tree through the seasons



*Materials Needed:*

- Cherry Tree drawing
- leaves & blossoms graphics
- color crayons or markers
- popcorn
- red powdered Tempera paint
- Elmer's school glue
- Popcorn Popping song

*Keywords:*

cherry, seed, pit, sweet, tart,  
Flathead Valley, Flathead  
Lake, scald, potassium,  
dormant

*Brief Description:*

What is a cherry? A cherry is a red or yellow fruit. It has a seed called a pit and grows on Cherry trees. Cherry trees take up to six years to mature enough to produce a crop. A six-year old tree will produce 300 pounds of cherries. Royal Anne, Vann's, Bing's, Lamberts, Lapin's and Rainer's are some sweet cherry varieties. Most sweet cherries are sold fresh during the summer months. Tart cherries are also grown in Montana, but are canned or dried. Tart cherries are used mostly in pies, but sweet cherries can also be used.

In Montana's Flathead Valley, cherries grow along the east side of the Flathead Lake. The lake has a moderating influence on the climate; this keeps the temperatures in this area mild. The ideal conditions when raising cherries would be to have at least 135 frost-free days and a limited amount of heat and rain. The heat can scald the cherries and leave bad spots; the rain acts like hail, it can split the skin of the cherries leaving a small sore. The soil surrounding the lake is very rocky and provides a perfect environment for the root systems of the cherry trees.

Cherries are low in calorie, fat and sodium. Cherries are a good source of potassium, fiber, Vitamin C, Vitamin B complex and other minerals.

The cherry tree goes through many changes in a year. In the winter, the cherry tree is just a trunk and branches. It is dormant, which means it is sleeping. When the weather warms up in the spring, buds begin to show and grow into new branches. Blossoms form on the branches and leave a wondrous fragrance. When the petals break away from the blossoms, they leave behind green buds that will eventually ripen into cherries. The fruit grows slowly over the next six to eight weeks. The cherries remain green until late June. They fill and ripen in the summer season and are ready to be harvested. Some cherry orchards allow people to pick their own cherries and others use machinery and sell them to stores. The first frost brings signs of fall. The leaves change color and fall off the tree. It begins again with the cherry tree as just a trunk and branches.

*Lesson:*

1. Have students learn the Popcorn Popping song, so as they work they can sing.
2. Photocopy enough of the Cherry Tree drawing for all students.
3. Have students color leaves and blossoms for the appropriate seasons.
4. Need to have enough white popped popcorn for each student as cherries.
5. Add popped popcorn to a clear plastic bag with Tempura powder and shake to color popcorn.
6. Have students decorate a cherry tree for each season.(Winter, Spring, Summer, Fall)  
Use the Tempura popcorn for the ripe cherries. Caution the students not to eat the colored popcorn. NOTE: Could also have dried cherries on hand for a snack.

## Popcorn Popping

Georgia W. Bello, b.1924;

$\bullet = 120$

Piano

I looked out the win - dow, and what did I see? Pop - corn pop - ping on the

4

cher - ry tree! Spring had brought me such a nice sur - prise, Bloss - oms pop - ping right be

8

fore my eyes. I could take an - arm - ful and make a treat, A pop - corn ball that would

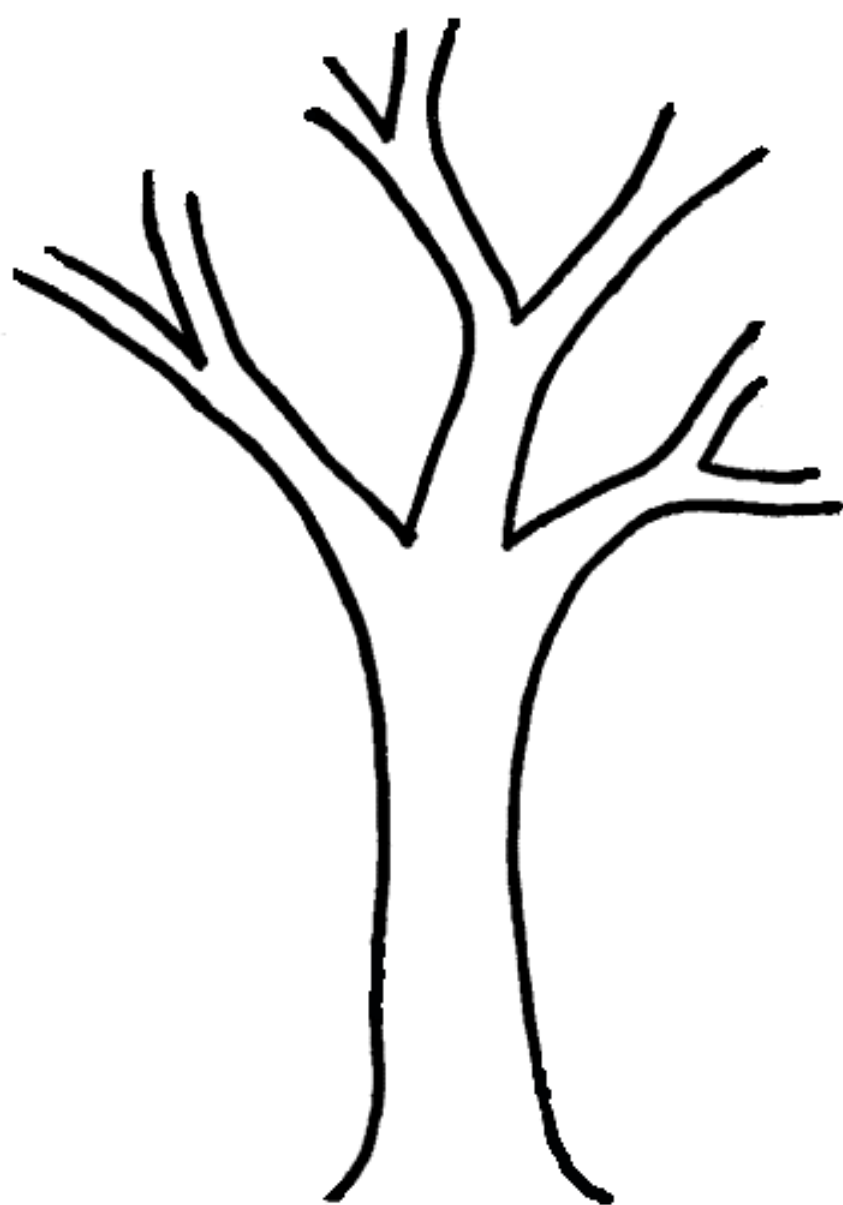
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smell so sweet. It was - n't real - ly so, but it seemed to be Pop - corn pop - ping on the cher - ry tree.

C G<sup>7</sup> C

It was - n't real - ly so, but it seemed to be Pop - corn pop - ping on the cher - ry tree.





# GROWING A CHERRY TREE

Grades: K-3

Subjects: Science, Math, and Art

Montana Standards: Science 1-5, Math 1-3,  
Art 1

Approximate Time: 60 minutes

*Objectives:* Students will

- of the age of a tree
- of how the weather effects cherries

*Materials Needed:*

- Tree cookies
- Sandpaper
- Vegetable Oil
- 3x5 index cards
- magnifying glass
- color crayons or markers
- yarn

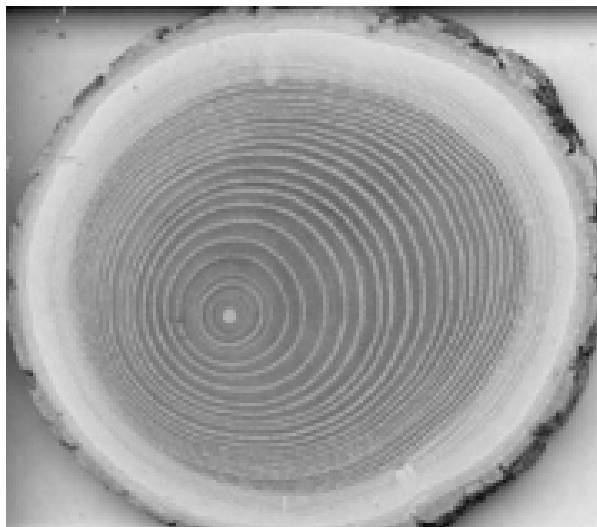
*Keywords:*

Flathead Valley, Flathead Lake,  
temperatures, scald, precipitation,  
drought, terrain

*Brief Description:*

In Montana's Flathead Valley, cherries grow along the east side of the Flathead Lake. The lake has a moderating influence on the climate; this keeps the temperatures in this area mild. The ideal conditions when raising cherries would be to have at least 135 frost-free days and a limited amount of heat and rain. The heat can scald the cherries and leave bad spots; the rain acts like hail, it can split the skin of the cherries leaving a small sore. The soil surrounding the lake is very rocky and provides a perfect environment for the root systems of the cherry trees.

Cherry trees grow in diameter by producing new wood in the layer just beneath their bark. The width of a given ring reflects the tree's growth rate in a particular year. The growth rate depends largely on precipitation during the growing season. Drought, disease, insects, fire and terrain affect the growth cycle of all trees.



*Lesson:* (Older students will be able to complete this activity. Younger students will be able to do items 1-6 and 9-10.)

1. Before the students' activity begins, have tree cookies cut out of a medium size log at about  $\frac{1}{2}$  inch thickness.
2. Explain to students that like them, trees also have an age. People have birthdays to tell their age, trees have rings to tell their age. Trees also have ways of showing factors that have influenced the trees' growth, such as moisture, drought, rot, broken branches, scaring, insects, and fire.
3. Have the students select a tree cookie, a piece of sand paper, vegetable oil and a magnifying glass.
4. The students will count the dark rings by sanding one side of the tree cookie and rubbing a few drops of oil over the sanded surface.
5. The students will look through their magnifying glass to count the number of dark rings.
6. On their index card, report the number of rings their tree has at the top of the card.
7. On the board, write one each of the following categories to create a graph. (You may have to add categories depending on the tree cookies. )  
1-6, 7-13, 14-20, 21-27, 28-34, 35-41, 42-48, 49-55, 56-60, 61-67, 68-74
8. Tape the index cards that the students have filed out about the category they fall into.
9. Drill a hole into each tree cookie and string with a piece of yarn for a necklace.
10. Have students color on them and write their name on their tree cookie.

*Assessment:* Have the students discuss whether the rings are all spaced evenly in their tree cookie. Are the rings equal or unequal? What could cause this to happen?

# AN EVERGREEN SOLSTICE

Grades: 2-3

Subjects: Math, Language Arts, Social Studies, Science

Montana Standards: Science 3-5, Social Studies 3-6, Math 5, Writing 1, Art 1

Approximate Time: 1 hour

*Objectives:* Students will

- Learn about the winter solstice and how it takes place.
- Construct a simple pinhole viewer.
- Understand why the evergreen tree was selected for the celebration of Christmas.
- Understand why all of this is linked together.

*Materials Needed:*

- Activity Sheet
- Piece of paper
- Two white paper plates
- Holiday decorations
- Glue
- Sweet tarts candies-1 for each student
- <http://www.realchristmastrees.org/types.html>

*Keywords:*

Christmas, eclipse, solstice, winter, evergreen, lunar, dormant, hemisphere, tilt, axis, planet, distance, tradition, ritual

*Brief Description:*

Because of the tilt, as the Earth makes its yearly orbit around the sun, different parts of the Earth get different amounts of sunlight. December 21 or 22 is the day of the year that the Northern Hemisphere gets the fewest hours of sunlight. This shortest day—and longest night—is the winter solstice. The evergreen tree was selected as the Christmas tree for this reason. It was the only tree that did not look dead or dormant during that time of year. The evergreen tree celebrated life during the gloomiest time of the year.

*Lesson:*

1. Explain to the students about the winter solstice.
2. Give out a sweet tart to each student.
3. Have the students hold them up at arm's length away.
4. Have the students hold their thumb on the half of the sweet tart, and then have them close one eye. Move their thumb closer to their eye till it covers their eye.
5. Distribute the activity sheet. Read through the directions. Some students may point out that they would prefer to cut and paste on Step One. You may choose to do that, but there is the possibility that they will learn more by copying the instructions.
6. Model using the pinhole camera outside. Sometimes it is tricky to find the sun. **DO NOT LOOK DIRECTLY INTO THE SUN!!**
7. Let students know that the image of the sun with the pinhole camera will be small. The distance between the camera plate and the screen plate is called the throw distance. The throw distance in feet, divided by 9, gives the image in inches. That means if there is nine feet between the two plates, the image will be one inch across. Sunspots might look like a fleck in the screen material.
8. When the students are finished, you might want to pair them up and practice with their pinhole cameras on the playground before wrapping them.

9. Explain to them about what the ancient people thought was happening during the winter solstice and how they celebrated during this time of year. May even read this brief explanation.

*Many ancient people believed that the sun was a god and that winter came every year because the sun god had become sick and weak. The ancient Egyptians brought green palm branches into their homes on the winter solstice as a symbol of life's triumph over death. The Romans also decorated with evergreens during Saturnalia, a winter festival in honor of their god of agriculture. The Saturnalia was a special time of peace and equality when wars could not be declared or fought. The Romans knew that the solstice meant that soon farms and orchards would be green and fruitful again. Centuries ago in Great Britain, woods priests called Druids used evergreens during mysterious winter solstice rituals. The Druids used holly and mistletoe as symbols of eternal life, and place evergreen branches over doors to keep away evil spirits. Later in the middle ages, Germans and Scandinavians placed evergreen trees inside their homes or just outside their doors to show their hope in the forthcoming spring. Our modern Christmas tree evolved from these early traditions.*

10. What kind of evergreen trees are there? There are many, but what specific kinds are used as Christmas trees? The below is a list of some Christmas tree species or types that are sold and grown in the United States. What kind of tree would you pick? What kind do you think are grown specifically in Montana?

*Assessment:*

Students should have followed the directions on the activity sheet for make the pinhole camera and use it correctly. Understand what the winter solstice is and how ancient people celebrated it. The students should understand that there are a variety of Christmas trees. For older students have them look up each tree to see what it looks like. For younger students have them draw and color what their Christmas tree would look like.

## Types of Christmas Trees

**Deodara Cedar** – *Cedrus deodara* – short, bluish-green needles; branches become pendulous at the tips; native to Himalayas; Deodara wood in Asia was used to build temples. In ancient Egypt Dedodara wood was used to make coffins for mummies.

**Eastern Red Cedar** – *Juniperus virginiana* – leaves are a dark, shiny, green color; sticky to the touch; good scent; can dry out quickly; may last just 2-3 weeks; a southern Christmas tree.

**Leland Cypress** – *Cupressus nelsonii* – foliage is dark green to gray color; has upright branches with a feathery appearance; has a light scent; good for people with allergies to other Christmas tree types. One of the most sought after Christmas trees in the Southeastern United States.

**Balsam Fir** – *Abies balsamea* – ¾” to 1 ½” short, flat, long lasting needles that are rounded at the tip; nice, dark green color with silvery cast and fragrant. Named for the balsam or resin found in blisters on bark. Resin is used to make microscope slides and was sold like chewing gum; used to treat wounds in Civil War.

**Douglas Fir** – *Pseudotsuga menziesii* – good fragrance; holds blue to dark green; 1” to 1 ½” needles; needles have one of the best aromas among Christmas trees when crushed. Named after David Douglas who studied the tree in the 1800’s; good conical shape; can live for a thousand years.

**Fraser Fir** – *Abies fraseri* – dark green, flattened needles; ½ to 1 inch long; good needle retention; nice scent; pyramid-shaped strong branches which turn upward. Named for a botanist, John Fraser, who explored the southern Appalachians in the late 1700’s.

**Grand Fir** – *Abies grandis* – shiny, dark green needles about 1” – 1 ½ “ long; the needles when crushed, give off a citrusy smell.

**Noble Fir** – *Abies procera* – one inch long, bluish-green needles with a silvery appearance; has short, stiff branches; great for heavier ornaments; keeps well; is used to make wreaths, door swags and garland.

**White Fir or Concolor Fir** – *Abies concolor* – blue-green needles are ½ to ½ inches long; nice shape and good aroma, a citrus scent; good needle retention. In nature can live to 350 years.

**Afghan Pine** – *Pinus oldarica* – soft, short needles with sturdy branches; open appearance; mild fragrance; keeps well; grown in Texas; native to Afghanistan, Russia & Pakistan.

**Austrian Pine** – *Pinus nigra* – dark green needles, 4 to 6 inches long; retains needles well; moderate fragrance.

**Red Pine** – *Pinus resinosa* – dark green needles 4”-6” long; big and bushy.

**Ponderosa Pine** – *Pinus ponderosa* – needles lighter colored than Austrian Pine; good needle retention; needles 5” – 10” long.

**Scotch Pine** – *Pinus sylvestris* – most common Christmas tree; stiff branches; stiff, dark green needles one inch long; holds needles for four weeks; needles will stay on even when dry; has open appearance and more room for ornaments; keeps aroma throughout the season; introduced into United States by European settlers.

**Virginia Pine** – *Pinus virginiana* – dark green needles are 1 ½” – 3” long in twisted pairs; strong branches enabling it to hold heavy ornaments; strong aromatic pine scent; a popular southern Christmas tree.

**White Pine** – *Pinus strobus* – soft, blue-green needles, 2 to 5 inches long in bundles of five; retains needles throughout the holiday season; very full appearance; little or no fragrance; less allergic reactions as compared to more fragrant trees. Largest pine in United States; state tree of Michigan & Maine; slender branches will support fewer and smaller decorations as compared to Scotch pine. It's wood is used in cabinets, interior finish and carving. Native Americans used the inner bark as food. Early colonists used the inner bark to make cough medicine.

**Carolina Sapphire** - *Cupressus arizonica* var. *glabra* – ‘Carolina Sapphire’ - steely, blue needles; dense, lacy foliage; yellow flowers and nice scent; smells like a cross between lemon and mint.

**Black Hills Spruce** - *Pinus glauca* var. *densata* – green to blue-green needles; 1/3” to ¼” long; stiff needles may be difficult to handle for small children.

**Blue Spruce** – *Picea pungens* – dark green to powdery blue; very stiff needles, ¾” to 1 ½” long; good form; will drop needles in a warm room; symmetrical; but is best among species for needle retention; branches are stiff and will support many heavy decorations. State tree of Utah & Colorado. Can live in nature 600-800 years.

**Norway Spruce** – *Picea abies* – needles ½” – 1” long and shiny, dark green. Needle retention is poor without proper care; strong fragrance; nice conical shape. Very popular in Europe.

**White Spruce** – *Picea glauca* – needles ½ to ¾ inch long; green to bluish-green, short, stiff needles; crushed needles have an unpleasant odor; good needle retention. State tree of South Dakota.

Name: \_\_\_\_\_

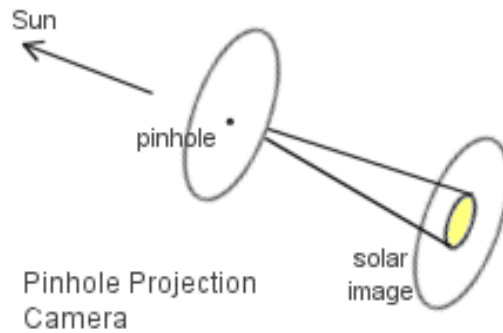
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## Festive Eclipse Pinhole Viewer

You can make a holiday pinhole viewer so that you and other members of your family can safely watch the solar eclipse.

What you will need:

- Two white paper plates
- A piece of paper
- Holiday decorations
- Glue



What you need to do:

### Step One

Neatly copy these directions for using a solar viewer on the back of one of the plates.

### Your Eclipse Solar Viewer

**Warning: Do not look directly at the sun! You can damage you eyes forever!**

Take the plate with the small hole (the camera plate) and hold it up toward the Sun. Have a friend hold the other plate (your screen). Without looking at the Sun, move the camera plate until you get an image of the Sun on the screen plate. This may take some practice and patience. When the light on the plate gets very bright, you have captured the Sun's image. To get it focused, your friend needs to try moving the screen closer and farther away from you.

### Step Two

Make the camera plate. With a pen or pencil tip make a small hole in the center of the plate. You are now finished except for the decorations!

### Step Three

Make the screen plate. Decorate the rim but be sure not to cover the hole. Make sure that someone can hold on to the plate. Be sure to leave the flat part white.

### Step Four

Carefully wrap and label your gift.

# PINECONE ORNAMENTS

Grades: K-3

Subjects: Art, Social Studies, and Language Arts

Montana Standards: Social Studies 4 & 6,

Writing 1, Reading 1, Art 1

Time: 30 minutes

*Objectives:* Students will

- Decorate a pinecone to hang on the Christmas tree.
- Understand that long ago ornaments were not bought but made.
- Students will write about what kind of rituals or traditions they do at their house at Christmas time.

*Materials Needed:*

- Pinecones
- Glue Gun
- Sequins
- String or ribbon
- Green paint in a bowl
- Small amount of garland, any color
- Hairspray

*Keywords:*

Pinecone, decorate, ritual,  
Christmas, ornament, tradition

*Brief Description:*

Students will make a pinecone ornament to hang on a Christmas tree. Evergreens were used to decorate homes (wreaths of holly, mistletoe, and pine) because the green showed that they were living when all other plants seemed dead.

The first decorated tree was at Riga in Latvia, in 1510. In the early 16th century, Martin Luther is said to have decorated a small Christmas tree with candles, to show his children how the stars twinkled through the dark night.

Until the mid 1800's Christmas trees were decorated with Christmas ornament that were edibles such as cookies, chains of popcorn, raisins, nuts, and pretzels. The tops of Christmas trees held flags, angels, or stars above the Christmas ornaments. The 19th century toys, bells, garlands, and paper Christmas ornaments were included as decorations.

Germany provided the world with the bulk of its unique Christmas ornament production. Nuremberg in Bavaria produced metal Christmas ornaments for export. Unique Christmas ornaments such as butterflies, stars, miniature musical instruments, and icicles of silver foil were among the Christmas ornaments to be produced. Dresden and Leipzig Germany produced embossed paper Christmas ornaments or cardboard Christmas ornaments known as Dresden's and angel hair. From the Thuringian mountains and Lauscha in Eastern Germany the creation of delicate blown glass Christmas ornaments began.

The glass pickle Christmas ornaments are the oddest German Christmas ornaments of all. For those who know the pickle Christmas ornament story and for those who participate in hanging the pickle Christmas ornament, solves the dilemma of who gets to unwrap gifts first. The glass pickle Christmas ornament is always the last Christmas ornament to be hung on the Christmas tree. The parents would carefully hide the unique Christmas ornament pickle in the Christmas tree among the other Christmas ornaments. When the children were allowed to view the Christmas tree decorated with Christmas ornaments, they would begin gleefully searching among the Christmas ornaments for the Pickle Christmas ornament. The children knew that whoever found the pickle Christmas ornament first would receive an extra little gift and would begin the unwrapping of the

Christmas gifts. The pickle Christmas ornaments and the other German glass ornaments have become keepsake ornaments that will be handed down to future generations.

*Lesson:*

1. Have the student's research and discuss what people did long ago when they decorated their Christmas trees. People long ago usually made their ornaments, what did they use? How is it different from today? Why do we put ornaments on the Christmas tree?
2. Take the pinecone and dip them in the green paint.
3. After it is dry let students glue the sequins on it.
4. Put little spots of glue to stick small piece of garland to the pinecone.
5. Once the glue has dried for a short time, take six inches of the string or ribbon and tie it to the top of the pinecone so it can hang from the tree.
6. Let completely dry and spray with hairspray to keep it together.
7. Have the students write a paragraph about a ritual or tradition that their family does at Christmas time. Is there a specific time that they get a Christmas tree? Do the children of the family always decorate the tree? Does everyone get to open one present on Christmas Eve?

*Assessment:*

Students should understand the history behind the ornaments on the Christmas tree. The Solstice Evergreen by Sheryl A. Kasas may be a good resource for the students to use as they research. Complete the pinecone ornament and paragraph about their families Christmas traditions. Lower grades you may want to read them a story and then do the pinecone ornament.

# COUNTING CHRISTMAS TREES

Grades: 2-3

Subjects: Math and Language Arts

Montana Standards: Math 4-7, Writing 1,  
Technology 1-3

Approximate Time: 45 minutes

*Objectives:* Students will

- Study the table showing total Christmas tree sales between 1990 and 2002.
- Study the table showing the percent of people who have real and artificial Christmas trees.
- Take their own survey to learn how many of their classmates' families have real trees and how many have artificial trees.
- Compare the data they collect to national data, using the Internet website for up-to-date statistics.

*Materials Needed:*

- Computer with Internet Access, National Christmas Tree Association Industry Statistics Web site:  
[www.realchristmastrees.org/industry](http://www.realchristmastrees.org/industry)
- Christmas Tree Sales Worksheet
- Colored pencils
- Graphing paper

*Keywords:*

data, graph, Christmas, tree, sales, survey, percent, prediction

*Brief Description:*

Students answer questions about a simple line graph that shows total Christmas tree sales from 1990 to 2002.

*Lesson:*

1. Provide students with the Christmas tree sales worksheet.
2. The worksheet provides a table showing Christmas tree sales from 1990 to 2002. Students study the worksheet, create a graph, and answer the questions.
3. This worksheet can be used as a homework assignment to be corrected in class, or as a classroom activity.
4. Conduct a survey of students to learn which of their families have real, artificial, and no trees. Then have students create a bar graph showing the information about household use of Christmas trees. The information shows the percent of homes that had real, artificial, and no tree in 2002. Why is the number of real trees in the households decreasing?

Real tree- 21%; Artificial tree- 48%; No tree- 32%

Make sure that they illustrate the results of their own survey accurately.

5. Have students write a paragraph explaining how the data they collected compare to the national data.

*Assessment:*

Lower grade students may only conduct the survey, cut out little trees and make a picture graph.

Upper grade students will score at least 80% on the worksheet and paragraph comparing their data and national data. If students are more advanced additional questions can be added. In how many years on the graph did sales decline from the previous year? If the average Christmas tree sold for \$35 in 2000, how much total income did Christmas tree sales produce that year? Between which two years on the graph did the biggest gain in sales of Christmas trees occur, and what percent increase was that?

*Answer Key:*

2. 32 million

3. 1993

4. 1991, 1995

5. 4 million

6. Up

7. 117,500,797

8. Down

NAME: \_\_\_\_\_

## U.S. CHRISTMAS TREE SALES WORKSHEET

Use the information provided in the table to answer the following questions.

YEAR	TOTAL TREES SOLD	% OF KINDS OF TREES IN HOUSEHOLDS		
		REAL TREE	ARTIFICIAL TREE	NO TREE
1990	35,376,404	38%	39%	23%
1991	36,970,932	39%	41%	20%
1992	34,367,151	37%	41%	22%
1993	35,244,264	36%	43%	20%
1994	33,016,060	34%	42%	24%
1995	37,154,290	37%	40%	23%
1996	31,676,800	32%	40%	28%
1998	32,181,594	35%	41%	23%
1999	35,364,350	35%	44%	20%
2000	32,006,247	31%	49%	21%
2001	27,800,000	24%	52%	23%
2002	22,330,200	21%	48%	32%

1. Create a bar graph using the information from the table above showing every year and how many trees were sold.
2. How many millions of Christmas trees were sold in the year 2000? \_\_\_\_\_
3. Were more Christmas trees sold in 1993 or 1994? \_\_\_\_\_
4. About 35 million Christmas trees were sold in 1990, 1993 and 1999. Which years were sales higher? \_\_\_\_\_
5. Christmas tree sales increased between 1994 and 1995. How many more millions of trees were sold in 1995 than in 1994? \_\_\_\_\_
6. In 1996, about 31 million Christmas trees were sold. Did sales the following year go up or down? \_\_\_\_\_
7. How many trees were sold in all from 1999 to 2002? \_\_\_\_\_
8. Looking at the graph you have made of total trees sold over the years what is your prediction of Christmas tree sales for the 2003, up or down? \_\_\_\_\_

# FINGER LEAF PRINTS

Grades: K-3

Subjects: Art, Language Arts, Math, and Science  
Montana Standards: Science 3, Math 4 & 7,  
Reading 1, Art 1 & 4

Time: 45 minutes, collecting of leaves not  
included (Lesson can only be completed in Fall)

*Objectives:* Students will

- Talk about the different textures of the leaves, how they look and feel.
- Sort the leaves by size, shape, and color.
- Explore the different trees that the leaves came from.
- Compare each finger paint leaf print to other classmates.

*Materials Needed:*

- Wide assortment of leaves
- Finger paint
- Newspapers
- White paper

*Keywords:*

Leaf, tree, texture, veins,  
characteristics, pattern, sort

*Brief Description:*

Students will take a walk outside to collect leaves that have recently fallen. Upon returning to your classroom, talk about how they look and feel. Invite the students to compare the leaves and sort them by size, shape, and color. Talk about the different types of trees that the leaves have fallen from. Before the students make their finger paintings, have them explore the slippery texture of the finger paint.

*Lesson:*

1. Ask each student to find the bumpy side of a leaf, the side with the raised veins.
2. Show the students how they can use their fingers to spread a thin layer of finger paint on the bumpy side of their leaves. Talk about how this side of the leaf feels.
3. Ask the students to put their leaves, paint-side down, on white paper.
4. Place the newspaper pages over them, and press to make the prints.
5. Remove the newspaper and peel off the leaves (with clean fingers).
6. Compare the physical characteristics of each student's leaf print.
7. Place the prints on a large piece of craft paper to make a fall class mural.
8. Have the students write a poem on their craft paper about their leaves.

*Assessment:*

Observe the different shapes, sizes, and vein patterns of leaves as they make finger paint leaf prints. If possible, take a walk or look outside your window to watch leaves falling from the trees. Notice how they glide, spin, or quickly drop down. Then put on some soft music and have the students pretend that they are falling leaves. Some books for extending the lesson are: All Falling Down by Gene Zion, Frederick by Leo Lionni, and The Wonderful Tree by Adelaide Holl; have the students respond to the reading and discuss.

# SEED MOSAIC

Grades: K-3

Subjects: Math and Arts

Montana Standards: Math 4 & 7, Art 1

Approximate Time: 1 hour

*Objectives:* Students will

- Study different geometric shapes and patterns.
- Understand what seeds are and where they come from.
- Learn about different textures, sizes, shapes, and colors of the seeds and how this relates to Art.

*Materials Needed:*

- Vegetable or flower seeds
- Zip-lock freezer bags
- Cardboard
- Pencil
- White Glue
- Small Cups
- Paintbrush

*Keywords:*

Mosaic, geometric, seeds, collage, variety, patterns

*Brief Description:*

Students will create a geometric seed mosaic with a variety of vegetable and flower seeds.

*Lesson:*

1. Collect a variety of seeds for the students to use in this project. Bigger seeds are better; some seeds are too small to handle especially for the younger students. Discuss with students the different vegetable and flower seeds and how they are made.
2. Have the students draw a geometric shape on the piece of cardboard with a pencil. (Quilt books are a nice way of showing the students examples of geometric patterns.)
3. Put a limited amount of white glue in a small cup.
4. Using a paintbrush, cover a small portion of the design with white glue.
5. Arrange seeds over the glued area following the lines and shapes the students have drawn.
6. At this point you could discuss with your students about the variations in texture, size, shape, and colors of the seeds.
7. Continue until the entire mosaic is covered. Allow the glue to completely dry, about 24 hours, before setting the collage upright or hanging.
8. When you are finished store any leftover seeds in zip-lock bags in a cool dry place.

*Assessment:*

Students should have drawn a geometric design on their cardboard and follow this pattern by gluing the seeds down. At the same time using a variety of seeds to create texture and color to their artwork. Have them assess what they like about their geometric design and if they know anything about the types of seeds they used.

# GREENHOUSE PLANTING

Grades: K-3

Subjects: Science, Language Arts

Montana Standards: Science 3, Literature 1 & 5, Writing 1

Approximate Time: 6 weeks to a month

*Objectives:* Students will

- View and compare an indoor and outdoor plant.
- Plant their own plant to grow from seed
- Understand the reason behind greenhouses.
- View the inside and outside of a seed.

*Materials Needed:*

- Jack's Garden by Henry Cole
- Plants outside
- Variety of seeds
- Clear plastic cups
- Soil
- Water
- Permanent black marker
- Journal paper
- Knife
- Magnifying glass

*Keywords:*

Plants, nursery, orchard, rootstock, ornamentals, foliage, rhizomes, turf, succulent, decorative, vegetable

*Brief Description:*

A nursery is a place for young plants. A nursery may have trees that farmers want to buy. The farmers will plant these trees in their fields so the fields will become orchards. Another nursery may have plants that you want to buy. You may buy a plant for your yard or for your home. Plants inside your home grow in pots, and sometimes we call them potted plants. A nursery usually has at least one greenhouse. This greenhouse is full of green plants, and the air must be kept just right—not too hot and not too cold—so the plants will grow.

Many greenhouse owners cannot operate during the winter months because of the high cost of heating. Greenhouse owners in the coastal areas of our country have an advantage because of their mild climate—both summer and winter—making a controlled climate inside their greenhouses less costly. California is the number one producer of nursery products in the United States.

Some nurseries provide the vines, trees, or seedlings for farmers to plant. Many trees grow on rootstocks, that is, they grow on a root other than the natural root. Using rootstock allows better production and heartier trees. Some trees are already grafted before selling to the farmer or grower. Nursery production may be divided into the following categories:

Foliage plants

Flowering potted plants

Bedding plants

Vegetable plants

Woody ornamentals

Vines, fruit and nut trees

Bulbs, rhizomes, turf, succulents, decorative

*Lesson:*

1. Read the book Jack's Garden by Henry Cole to the students.
2. Look around you school and have students located a tree, bush, or plant to observe.
3. Describe the plant. Why do you like it? Do you know the plant's name? What you're your plant need to grow? Have the students write a paragraph and draw a picture about their plant in their journal. Make sure the students understand what a journal is.

4. Ask the students to keep a journal and record all of the changes in their plant. Note changes in flowering, growth, fruit, production, disease, etc. Also any wildlife, such as birds or squirrels. Encourage your students to be aware of the life around them.
5. Bring a variety of seeds to the class so the students can pick what kind of plant they would like to grow in the classroom.
6. Cut a few of the seeds in half with a knife.
7. Have students look at the seeds through a magnifying glass.
8. Students can view the inside and outside of the seed.
9. Put some soil in a cup. Use clear plastic cups so students can see the roots growing.
10. Place seeds in the soil.
11. Label each cup with what is growing in them and the students name using a marker.
12. Water the seeds. Do not overwater or underwater.
13. As the plants grow discuss with the students the parts of the plant. What are the leaves? What are the roots? Where is the stem?
14. At the end of several months they should give a brief oral report on both their inside and outside plants.

*Assessment:*

Students should understand the difference of growing a plant inside, like the in the greenhouses, and outside. Encourage students to read about seeds and plants. Some suggested books are From Seed to Plant by Gail Gibbons, The Tiny Seed by Eric Carle, The Reason for a Flower by Ruth Heller, Anna's Garden Songs by Mary Steele, Jack and the Beanstalk by Susan Pearson, and How a Seed Grows by Helene J. Jordan.

# COMPOST IN A BOTTLE

Grades: 3

Subjects: Science, Math and Literature

Montana Standards: Science 1, 2 & 4, Math 5,  
Writing 1 & 6

Time: 30 minutes and 5 weeks

*Objectives:* Students will

- Cite four functions of horticultural soils that can be distinguish from soils for general agriculture.
- Describe why each type of soil has both good and bad qualities.
- Make compost in a bottle.

*Materials Needed:*

- Shallow bowl
- Wide sampling of inorganic and organic soil amendments
- 2 liter soda bottles cut in half
- Spray bottle
- Garden soil
- Spoons
- Vegetable or fruit scraps
- Leaves, grasses, and small twigs
- Cheese cloth
- Rubber bands

*Keywords:*

Soil, ornamental, horticulture, texture, amendments, environment, organic, inorganic, compost

*Brief Description:*

The management of soils for gardening and ornamental horticulture is, on the whole, more intensive than that for agriculture in general. Especially in the area of nursery production and the production of high-value specialty plants, the value of the plants justifies higher growing costs. Growers can afford to spend money on, among other things, relatively expensive soil amendments to attain better and faster results. In the landscape, the high value of plants in relation to their size and placement, justifies the extra inputs necessary to provide and maintain a soil environment conducive to plant vigor.

Horticultural soils have the same functions as general soils, with a few points emphasized.

Support: Besides providing support, the soil for many nursery products is part of the packaging and marketing material. Keeping soils light is important for this reason. Nutrients: Most horticultural products are grown with very high levels of nutrient added from sources other than the soil (fertilizers). A fertile soil is desirable, especially in a landscape situation, but not imperative. Still, soil conditions must be correct for effective nutrient exchange (ph, CEC, etc.).

Moisture: Water must be able to move in and out of horticultural soils with ease. Air: Air is extremely important in horticultural soils, especially where fast growth (from high rates or respiration) is desired.

*Lesson:*

1. Have students collect samples of a variety of soil amendments, learning the name and uses of each, and whether they are of organic or inorganic origin.
2. Have students gather around a work table; you may want to lay down plastic or newspaper this can get messy.
3. Examine each soil sample to see the good and bad sides of each type.

4. Have the students graph their findings of organic and inorganic soils or good and bad soils.
5. Make compost in a bottle.
6. Lay out the assortment of materials. Food scraps, leaves, grass, twigs.
7. Instruct students to place the materials in the bottle in alternating layers of brown, green, brown, etc... Make the layers ½ inch thick. A 50:50 mixture of browns and greens usually works best. A pile too high in browns will break down too slowly. A pile in greens will get slimy and smelly.
8. Cover the food scraps with a thin layer of dirt so that there will be no smells or bugs. Repeat the layers until the cup is filled to about one inch below the top.
9. Add three to six tablespoons of water so the compost becomes moist, but not soaking wet.
10. To deter fruit flies and other pests, attach a piece of cheese cloth over the cup with a rubber band and have the students put their names on the cups.
11. Place the cups on a window sill or other appropriate place in the classroom.
12. Students should stir their cup of compost once a week and spray it with water if it starts to dry out.
13. Each week, for about 5 weeks, observe the various stages of decomposition. Involve the senses during observation time. What does the compost look, feel, and smell like? Keep a class chart to record their observations.

*Extended Lesson:*

14. Once the compost is finished, use it as a seed starter. Explain that compost adds plant food to the soil and improves soil conditions so that vegetables and flowers grow healthy and strong.
15. Poke a few holes in the bottom of each bottle to allow water to flow out. Place a saucer or lid under the bottle to catch any excess water.
16. Plant seeds (marigolds, radishes, and beans germinate quickly) into the compost.
17. Place cups in a sunny spot and keep it moist by watering regularly. You may also try to use the top of the bottle that you cut off earlier to cover the seedling in the cups.
18. The students might also experiment with where they place their cups of compost affects how their seeds grow.

*Assessment:*

Using their collection for review, students should be able, presented with an array of soils, to recognize and name the various materials. In the students bottles of compost are there any compost critters at work? Hand lenses or magnifying glasses will allow the students a closer look. At the end of 5 weeks discuss the results of the composting activity. Have them write a description of the decomposition process and a conclusion about the value of composting.

# LOVE THOSE POTATOES

Grades: K-3  
Subjects: Math, Science & Health  
Montana Standards: Math1 & 6, Health  
Enhancement 5, Science 5  
Approximate Time: 4 days

## *Objectives: Students will*

- Identify the many ways to prepare a potato for eating.
- Choose and graph their favorite potato product.
- Sample numerous types of potato products.
- Become aware of the various ways potatoes are processed for the consumer.

## *Materials Needed:*

- Potato products-examples
- Large paper potato
- Graph
- Ingredients and supplies for potato cakes or baked potato bar

## *Keywords:*

preservation, freezing, canning, dehydrating

## *Brief Description:*

Potatoes were first grown by Indians in the Andes Mountains of Bolivia and Peru as early as 200 A.D. Archaeologists have pictures of potato plants in designs on ancient pottery. The Indian preserved the potatoes by trampling them and then drying them.

Even though potatoes were first grown in South America, people in North America did not start eating them until after they became a popular food in Europe. European explorers carried potatoes from South America to Europe. European explorers carried potatoes from South America to Europe in 1570. About 150 years later the rulers of several European countries ordered their people to start growing potatoes. Potatoes became the main food for the people in Ireland. In the 1840's disease wiped out the potato crop in Ireland for two years in a row. Many Irish people moved to America because they had no food to eat.

Today, most of the world's potatoes are grown in Europe. Potatoes are also grown in all 50 of the United States. The biggest potato-producing state is Idaho. Many people in the U. S. grow potatoes in home gardens and harvest the potatoes while they are still small. These are called new potatoes. The average American eats about 65 pounds of potatoes a year.

Montana growers sold about 250 million pounds of certified seed potato tubers in 1998, according to Ralph Peck, director of the Montana Department of Agriculture. This amounted to over \$20 million in sales for the seed potato industry.

Montana's seed potato growers are leaders in the seed potato industry, "Peck said. Through the Montana Potato Improvement Association (MPIA) and Montana State University, the seed potatoes are tested and scrutinized to provide only the finest in seed stock for the industry. The department provides shipping point inspection to document the quality of the product at shipping. Seed potatoes are shipped from Montana to numerous locations around the world, including the Pacific Northwest and Canada.

Montana's seed potatoes are grown in numerous western Montana valleys. Although Montana is best known for its seed potato production, the state produces potatoes for direct consumption as well.

Potatoes were first grown in Montana in the Bitterroot Valley at St. Mary's Mission in 1841 by Father DeSmet. The first potatoes grown commercially in Montana were in Virginia City at the mining camps in the 1860's. Potatoes were very important to the miners' diet because they were the only source of Vitamin C that most miners had.

A potato is a plant called a tuber. A tuber grows underground on stems. The potato plants grow leafy stems and flower above ground, and stems and tubers below ground. These tubers then become the potatoes. Potatoes take 60-90 days to develop into an edible stage. Some plants can grow 10 to 20 tubers (potatoes) underground but most potato plants average three to six tubers.

Potatoes are replanted each year because the plants die after the tubers mature into potatoes. Potato growers that grow lots of potatoes use machines to plant the potatoes. Small, whole tubers and segments of tubers are planted and new potato plants grow from these pieces. The tuber segments have at least one eye (bud) and the whole segments usually have more than one eye. These “eyes” develop into new stems which grow above and below ground. Then the stems below the ground will grow new tubers. When these tubers are mature, the potato growers use potato harvester to dig the potatoes out of the ground. These harvesters also separate the potatoes from the soil and put the potatoes into trucks.

#### *Lessons:*

1. The class and the teacher will brainstorm the numerous potato products. The teacher will write all of these products on a large brown paper in the shape of a potato. Examples (mashed, baked, fries, tater tots, chips, hash browns, gems, jojos, etc.)
2. The teacher will prepare a graph with a manageable number of favorite ways to eat a potato. The students could choose one or two favorites to be graphed. Possibly the teacher could lead a discussion on the most healthy type of potato product.
3. The teacher will provide potato products that are processed either through dehydration, freezing, frying, or canning. A whole group discussion will follow and children will be asked to bring various products from homes that are processed in any of the previous manners. The following day the students will present their products and explain the processing method that was used.
4. As a culminating activity you will make Potato Cakes (recipe included) or a Baked Potato Bar. A potato word search will be available for those who are waiting to cook their potato cake.

#### *Assessment:*

Students should identify the different ways in which potatoes can be prepared for eating. They should also be aware of the various ways potatoes are processed.

## Potato Cakes

$\frac{1}{4}$  cup butter

$\frac{3}{4}$  cup white flour

$\frac{1}{2}$  teaspoon salt

$\frac{1}{2}$  teaspoon baking powder

3 cups freshly mashed potatoes (with milk)

Cut butter into flour until it forms large granules. Add salt and baking powder; mix well. Mix in potatoes. Knead for a few minutes. (This could be completed in a large zip-lock bag.) Roll out onto lightly floured board with floured rolling pin. (This mixture could be quartered and placed in sandwich size bags for individual students. The students could press the mixture flat rather than roll it out with the rolling pin.) Cut into four rounds. Cook on a lightly buttered griddle. Students may choose toppings that are supplied by the teacher and parents. Serve hot.

# POTATOES

D S T J X N D L G O I S N C A  
E A H A E S P U T Q R N F F P  
T C L Z T O E A P O E W R D Z  
X U O A T E T I O S L O E E G  
B R O A S O R T R T A R S H C  
F P T R P O S T S F N B H S Y  
E O P D P G T W O V D H O A U  
D J E U C S M A S T I S S M C  
T E D E K A B W T M S A P A D  
S O H K T R N Z C O B H I G C  
J E B E U O E N H U P W H Q S  
W O Z Y B Y F E E M R N C O N  
T W I C E B A K E D K L J O G  
L K L S R R E W O L F O Y F D  
U F F L A K E S O M J S D U B

BAKED  
CHIPS  
FLAKES  
FRIES  
IRELAND  
POTATO  
SEED POTATO  
TATERTOTS

BUDS  
CURLY  
FLOWER  
FROZEN  
JOJOS  
POTATO SALAD  
SPROUT  
TUBER

CANNED  
EYES  
FRESH  
HASHBROWNS  
MASHED  
ROOTS  
SPUD  
TWICE BAKED

# POTATO "PHACTS"

Grades: K-2

Subjects: Science

Montana Standards: Science 1, 2, & 3

Approximate Time: Spring, 2 months

*Objectives: Students will*

- Observe and understand the growth process of the potato plant.
- Understand that the final product is actually the seed.

*Materials Needed:*

- Seed Potatoes
- Half-gallon milk cartons
- Soil-prefers sandy soil
- Small rocks
- Tub for soil

*Keywords:*

Seed potato, tuber, harvester, eyes, roots, sprouts, stems, vines

*Brief Description:*

There are four main reasons Montana is a natural place for seed potato production.

1. Cool nights are conducive to a high solids potato and high solids potatoes make better and more viable seed.
2. Montana has fewer vector insects (an insect carrier of a disease-producing virus) which, in turn, means a lower rate of spread of several serious virus diseases. Most other potato producing areas in other states cannot produce their own seed because insects inject viruses into the crop, so they come to Montana for seed! Even though Idaho produces the most potatoes in the nation, their seed come from Montana!
3. Montana has "isolated" fields and that reduces the chances of disease contamination. This isolation is not possible to growers in other potato-producing states.
4. Because of our cool fall and spring weather, Montana's climate provides a good long-term storage situation and helps eliminate the expense of refrigeration.

Montana does not get high yields per acre and grows a relatively small-sized tuber-very desirable by the seed trade. So Montana grows a small, high solid, disease-free potato for commercial-producing areas at lower elevations. The process of growing the potato from the seed potato to a plant producing several tubers.

*Lessons:*

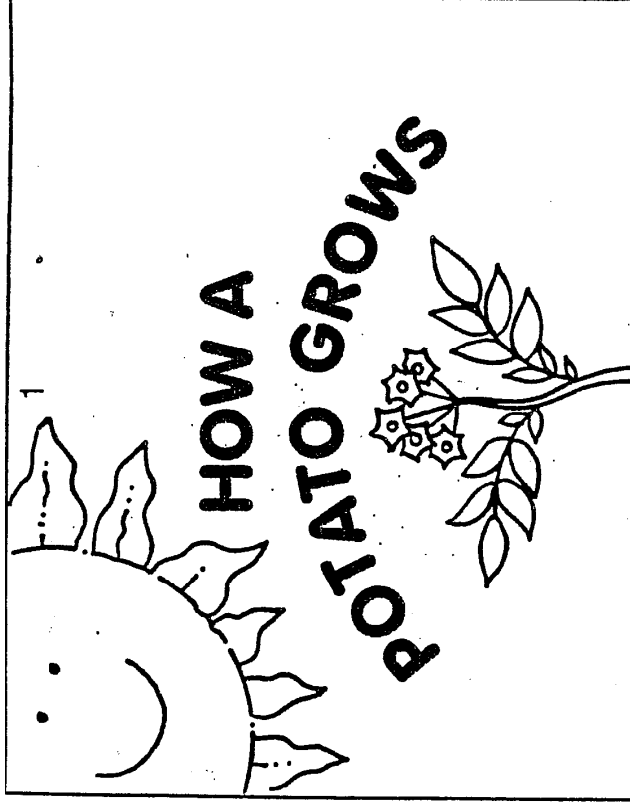
1. Teacher draws a diagram on the board on how a potato grows. Have a group discussion to thoroughly explain the process. Be sure to discuss the eye of the tuber as a vital part to begin the growing process. After the teacher feels the students have a good understanding of the growth process, then pass out the HOW A POTATO GROWS diagram work sheet. Have students color, cut out, and glue together in the proper order.
2. Using the POTATO PLANTING step-by-step guide, do the activity to emphasize the importance of the eye in growing a potato plant. Observe the development of the root system and stem of the beginning of the potato vine.

3. Individual planting of potatoes. Each student will be given a half-gallon milk carton. They will be called to a back table to place the small rocks, sandy soil, and a seed potato into the milk carton, in this order; covering the seed potato with about 2-inches of soil. The teacher will assist the students in watering their seed potato after the planting. While calling students back in very small groups, the remaining students can be working on creating their Potato Person. (sheets included) After the plants reach approximately six inches, send them home with the students to be planted in their gardens or flower beds for further growth and harvest in the fall.
4. 1 potato 2 potato. The students form a circle with the teacher in the center. The students hold both forearms out, elbows at their sides, with fists formed, thumbs on top. The teacher forms a fist and taps each child's fists, one at a time, and all chant: 1 potato, 2 potato, 3 potato, four, 5 potato, 6 potato, 7 potato, MORE. On the word MORE, the child must put that hand behind his or her back and this repeats over and over. When both hands have been put out, that child may now be the person in the middle and continue until everyone is out. That ends the game. After playing this game once, the teacher may want to choose a student to be in the center first the next time the game is played.
5. Visit a local potato operation. This will enable the students to see how a portion of the operation works.

*Assessment:*

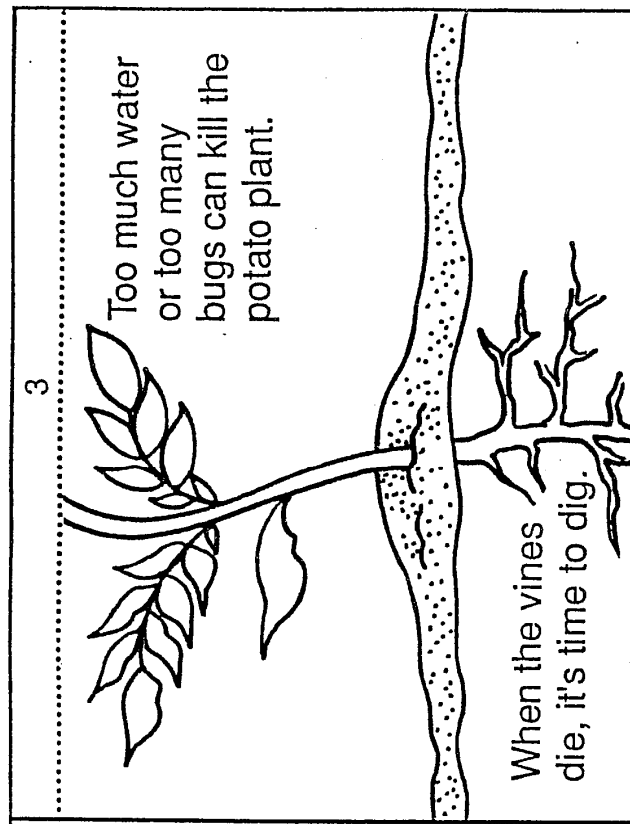
The teacher may wish to survey the students in the fall of the next year to see who harvested their potato crop and how it produced

1



# HOW A POTATO GROWS

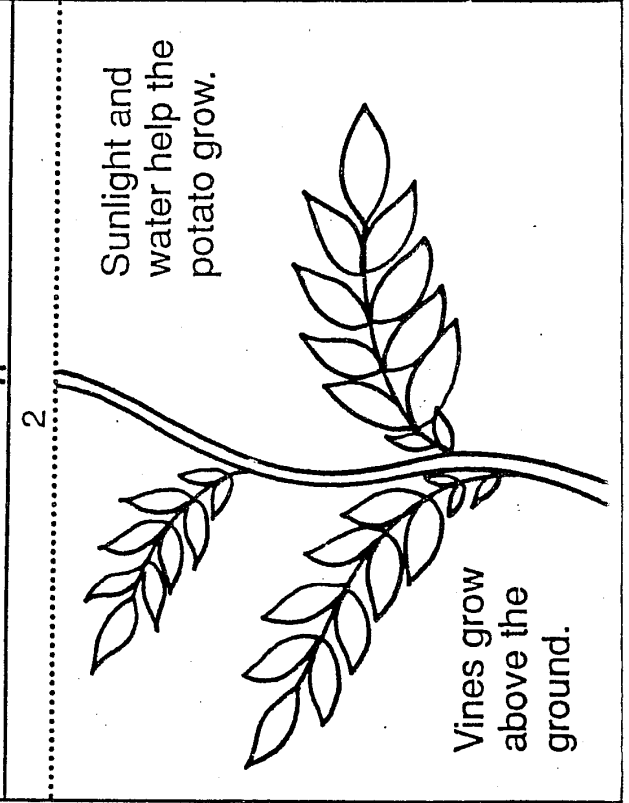
3



Too much water  
or too many  
bugs can kill the  
potato plant.

When the vines  
die, it's time to dig.

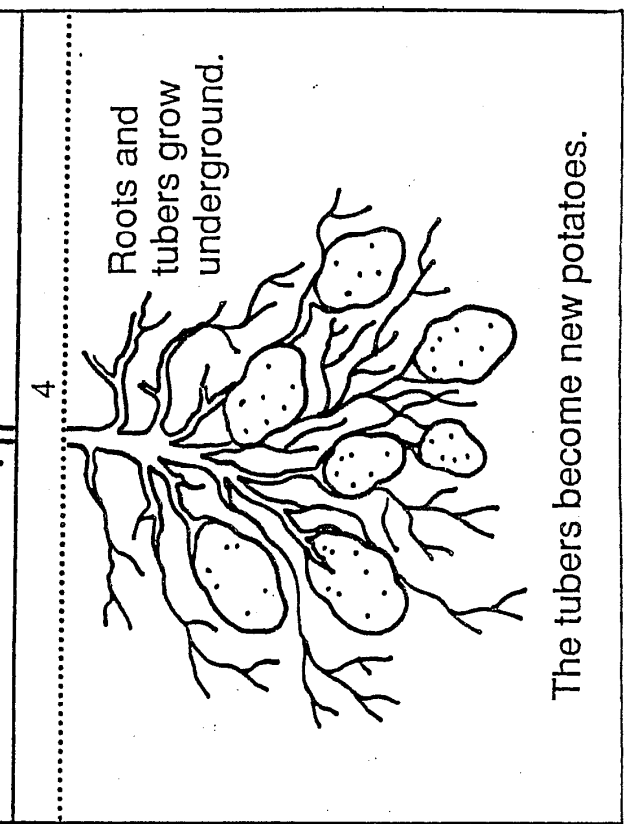
2



Sunlight and  
water help the  
potato grow.

Vines grow  
above the  
ground.

4



Roots and  
tubers grow  
underground.

The tubers become new potatoes.

# POTATO PLANTING

You will need:

Potato

Knife

Dirt

Potting soil

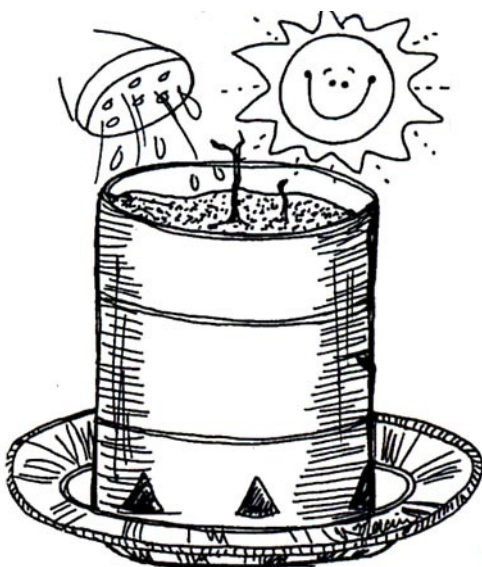
Large can

Bottle opener

Pie pan

Water

1. Mix the garden dirt with the potting soil that you have a mixture of  $\frac{1}{2}$  dirt and  $\frac{1}{2}$  potting soil.
2. Put a layer of small stones or gravel in the bottom of the large can. Fill can  $\frac{2}{3}$  full of soil mixture.
3. Cut your potato into 4 pieces. 3 of the pieces must have eyes, or buds, on them. One piece should have no eyes or buds.
4. Plant your 4 potato pieces in the can. Cover with more soil then add water.
5. Use a bottle opener to punch 4 holes in the bottom of the can for drainage.
6. Put a pie pan underneath the can to catch drainage.

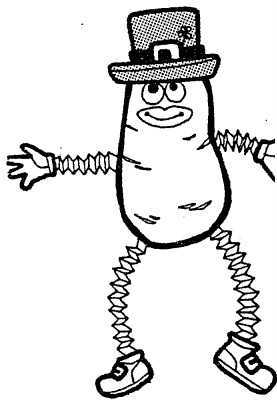
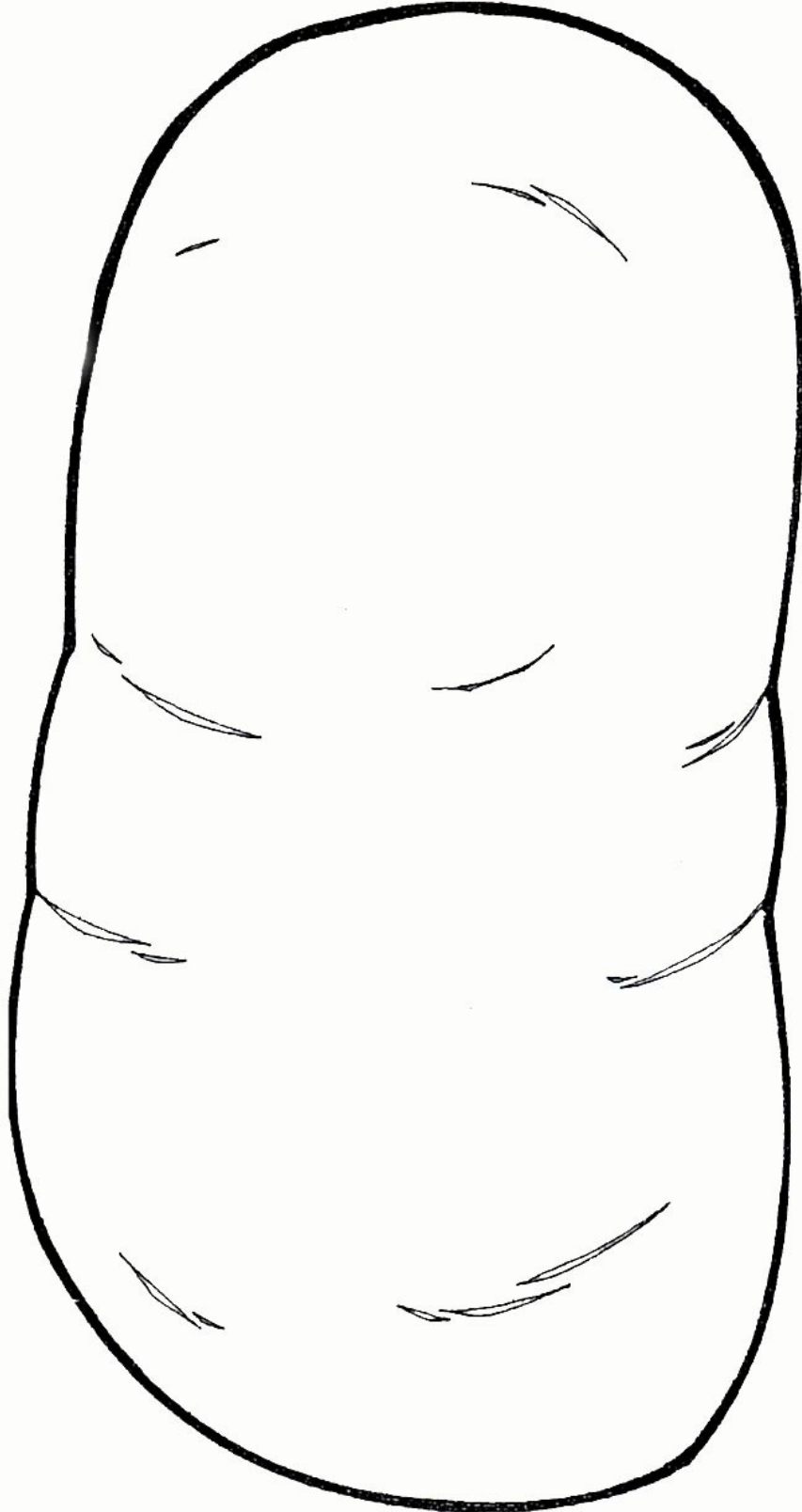


Place in a sunny area. Water when needed.

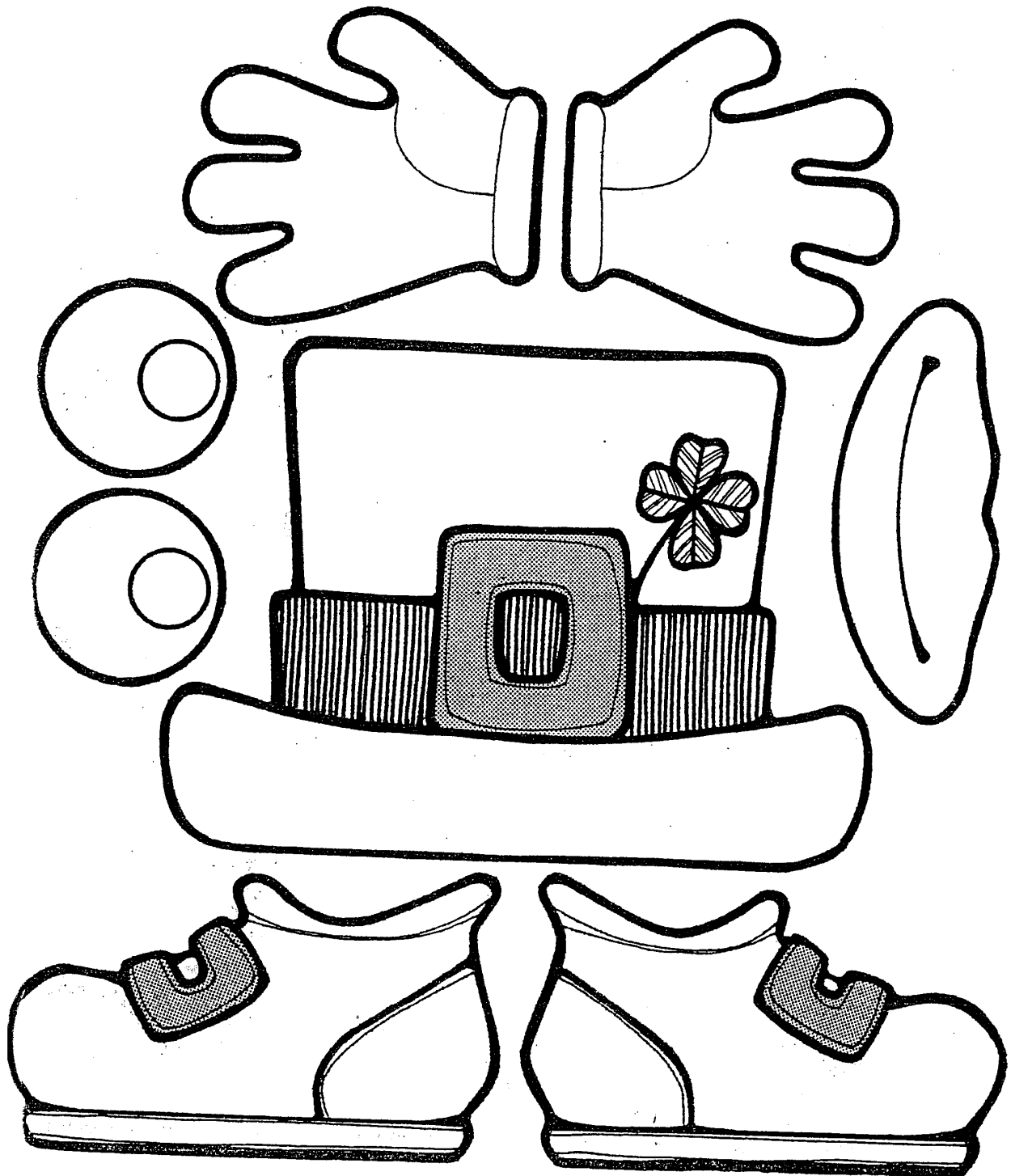
7. When a stem has grown at least 2 inches in height, uncover the potato pieces.
8. Draw diagrams of the plants' development.

## POTATO PERSON PATTERN

1. Color and cut out the mouth, eyes, hat, gloves, and shoes on the next page.
2. Color and cut out the potato on this page.
3. Glue the hat, eyes, and mouth to the potato.
4. Accordion fold two 1-by-8-inch strips of construction paper for arms.
5. Accordion fold two 1-by-12-inch strips of construction paper for legs.
6. Glue one glove to one end of each arm.
7. Glue one shoe to one end of each leg.
8. Glue legs and arms to potato as shown.



# POTATO PERSON PATTERN



# Apples All Around

Grades: K-3

Subjects: Science, Writing, and Art

Approximate Time: 3-20 to 30 minute sessions

Standards: Science: 1, 2, and 3; Writing: 1, 2 and 4; Arts: 1 and 6.

*Objectives:* Students will

- Comprehend and respond to literary works.
- Be able to draw an apple tree depicting what it would look like in each of the four seasons correctly and in sequence.
- Become aware of the life cycle of an apple tree and how an apple grows.

*Materials Needed:*

- Book: How Do Apples Grow? by Betsy Maestro.
- Book: The Seasons of Arnold's Apple Tree by Gail Gibbons.
- Apple patterns for shape book.
- Prints (tempera or water color) and small pieces of sponge.
- Apple and tree patterns for labeling. (Tree pattern pg. 14)
- Hunt for Apple Parts worksheet.
- One apple per student

*Keywords:*

Core, blossom, bud, stem, spring, winter, autumn, summer, petals, pollen, seeds, nectar, flesh, skin

*Brief Description:*

The first trees to produce sweet, flavorful apples similar to those we eat today, were found many thousands of years ago near the modern city of Alma-Ata, Kazakhstan. Greeks several varieties of apples by the late 300's BC. Ancient Romans also grew apples and loved the fruit. Charred remains of apples were found in a Stone Age village in Switzerland. In the early 1630's records show that apples were being grown in New England with seed and trees brought to the new world by European settlers. In 1796, in Ontario, Canada, John McIntosh discovered a variety of apple, which is today enjoyed by people around the world. There are many legends about apples from our past. In the Bible, apples in the Garden of Eden tempted Adam and Eve. Swiss tell the story of William Tell; an archer who was arrested then promised his freedom if he could shoot an apple off his son's head. Americans have the legend of Johnny Apple seed who was famous for planting apple seeds and trees in Ohio, Indiana, and Illinois.

Apples are in the Pome family—a fruit bearing whose seeds are embedded in the core of fruit. Apples are members of the rose family. The average tree will produce fruit in about three years. One tree can produce about 20 boxes of apples. Washington State produces the most apples in the United States, followed by New York, Michigan, California, and others. In Montana most of the apples are grown primarily in the western valleys and south central part of the state. Apple trees prefer to grow on hillsides and tops of hills for drainage and because the cooler, heavier air falls to the valley bottoms. Apple trees need to rest in the winter for about 900-1,000 hours below 45 degrees Fahrenheit in order to flower and fruit properly. In the spring the trees produce white blossoms, which fall off leaving the pollinated flowers, baby apples begin to grow in their place. Farmers placing hives in the orchards use bees for pollinating the blossoms. During the summer the apples ripen and in the fall they are hand picked. A well-developed apple will have 5

compartments called carpels containing 2 seeds per carpel. If an apple tree is not healthy enough or the blossoms are not pollinated enough, the seeds will not develop properly.

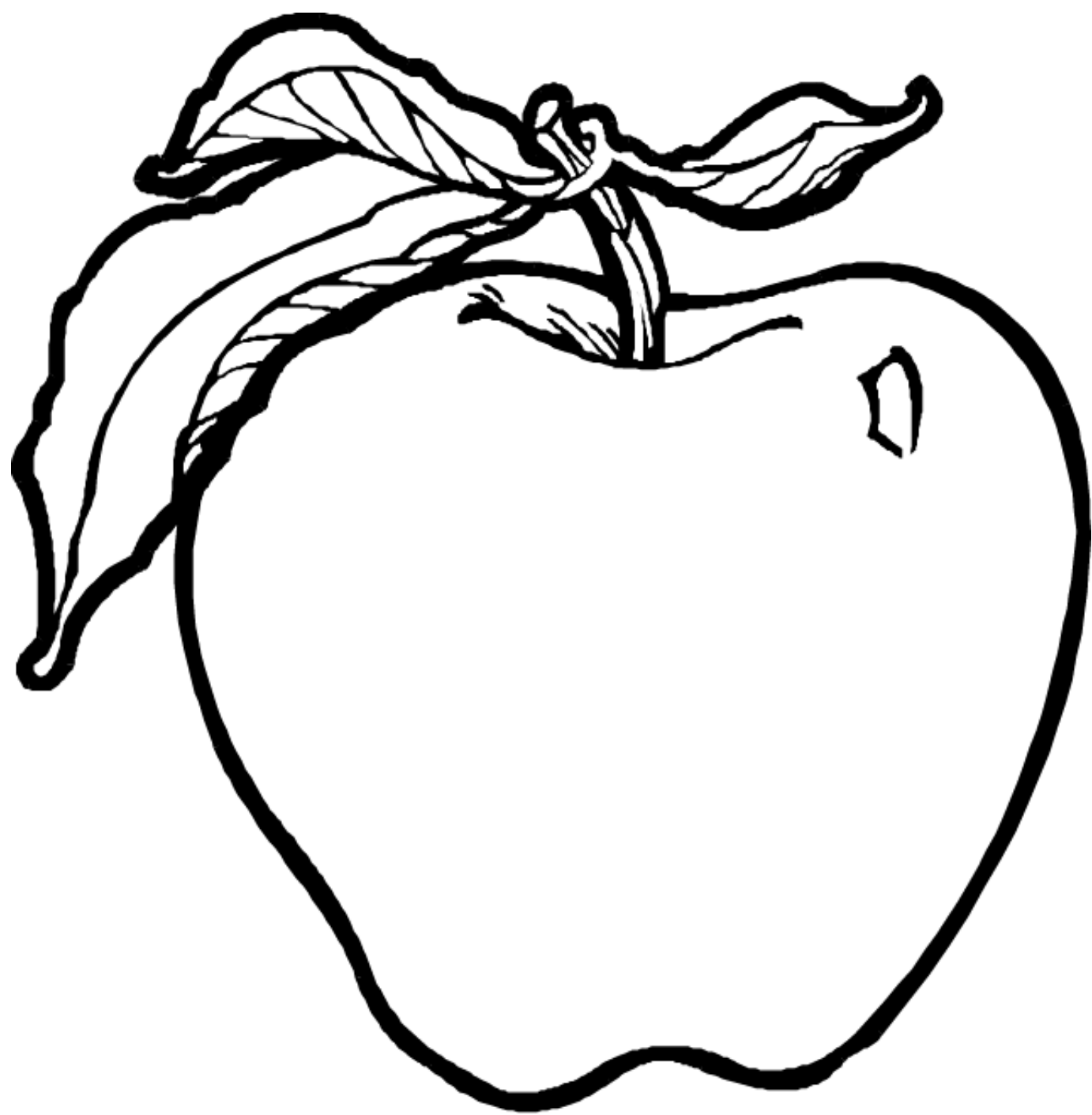
At the turn of the century newcomers to Montana were attracted to the Bitterroot Valley because of the irrigated land, which was marketed in orchard parcels. Growing apple trees in Montana is quite difficult because of the many variations in climate through out the state. Those apple trees that do have such here are the McIntosh, Lodi, Goodland, Carroll, Empire, and Haralson.

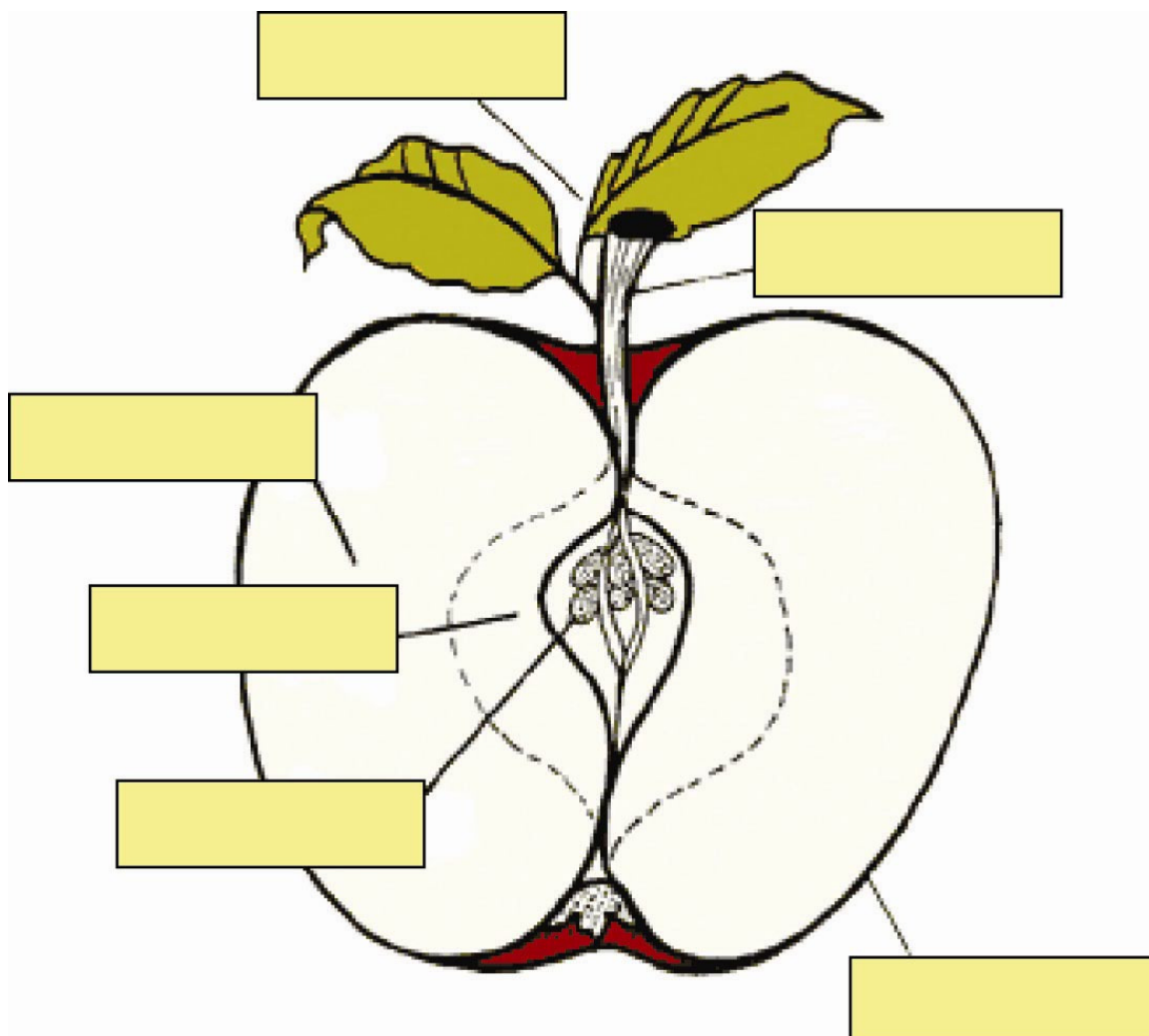
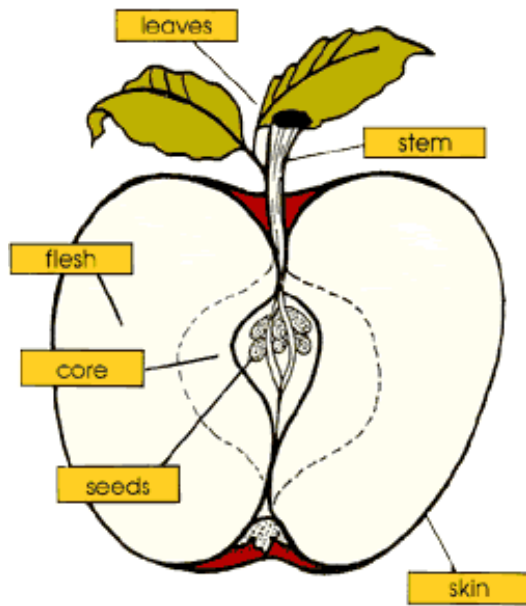
### *Lesson:*

1. What is an Apple: Have a variety of apples on display for the students to examine. After students have had an opportunity to look at the apples, discuss what they see and know about apples, where they come from, and the parts of the apple, etc. Record their findings on an apple shape. Read the book, How Do Apples Grow? by Betsy Maestro and the story The Seasons of Arnold's Apple Tree by Gail Gibbons. Add information to the apple chart. Introduce webbing and have the students sort main ideas (headings) specific to apples putting one heading on each apple pattern, then sort the responses to the correct heading.
2. The Seasons of an Apple Tree: review the stories read in the previous lesson. Using a piece of paper 5 1/2" by 18" have the students fold the paper into 4 equal parts. Label each section with the name of a season in sequence. Take the students to look at an apple tree. Draw one tree in each of the boxes. Using red, pink, green, and brown paint, have the student paint what their trees should look like in each season. When dry, have the students cut the pages apart and write a least two sentences about the tree in the season on each page. Make a cover with a title and name. Share the books with the class.
3. Parts of an Apple Tree and an Apple: "The Little Red House With No Doors"—share the story with the class; as the story is told take an apple and cut it cross ways. Give each student an apple and have him or her predict if his or her apple will have a "star" inside. Record the predictions on a bar chart. Also estimate how many seeds will be in the apple and post their responses. After cutting the apples open, check the predictions and estimations. Explain the scientific process and have the class write a question concerning the number of seeds in each apple and if cut cross wise, would each apple have a star inside. Next write hypotheses, the procedure. Have the students collect many different kinds of apples and check findings. Explain why some apples have a different number of seeds in each carpel than others.

### *Resources:*

The Seasons of Arnold's Apple Tree by Gail Gibbons  
How Do Apples Grow? by Betsy Maestro  
"The Little Red House with No Doors"  
Activities Integrated with Math and Science 1984





## Kernel Surgery

Grades: 1-3  
 Subjects: Science  
 Montana Standards: Science 2-5  
 Approximate Time: 45 minute

*Objectives:* Students will

- Learn the four major parts of a corn kernel and the function of each.

*Materials Needed:*

- Corn kernels
- Worksheet of the kernel

*Keywords:*

Production, product, ethanol, germinate, genetic, kernel, starch, plastic, bushel, pericarp, disease, endosperm, gluten

*Brief Description:*

The kernel is the most important part of a corn plant. It is the seed! It contains everything necessary for a new corn plant to germinate and begin its life. This small capsule contains all the food needed to provide energy for the germinating plant until it can feed itself. It also contains all the genetic material that will determine the traits of that plant. It is the product! Kernels are full of the nutrients and energy that people and animals need from their food. There are over 3000 human food uses for the kernels and their contents. Ground corn kernels are the major part of the diet for most of the animals raised for meat production. The starch and other components of kernels can also be used for industrial purposes, for example, ethanol fuel and plastic.

There are four major parts of corn (and all of them have kernels with the same four parts). Sweet corn that is eaten as a vegetable, field corn that is refined for industrial uses in addition to food products and animal feed, pop corn that is eaten as a snack, seed corn that farmer's plant in the field for crop production.

The typical ear of field corn contains 600-800 kernels. There are over 70,000 kernels in a bushel of corn. A bushel of corn typically sells for \$2-\$3. From that bushel of corn, from those 70,000 kernels it is possible to produce 2.5 gallons of ethanol fuel, or 31 pounds of cornstarch, or 33 pounds of corn sweetener, plus 11 pounds of animal feed, over 2.5 pounds of gluten meal, and 1.6 pounds of corn oil.

*Lesson:*

1. Ask students to read the story David Makes Cupcakes, paying close attention to the last several paragraphs which describe many of the food products made from corn.
2. Discuss with students the importance of these kernels.
3. Hand out kernels of corn to the students for them to see and touch.
4. You can cut the kernels to look at the inside of them. You may need to soften some kernels so the students can cut them in half, or do this yourself prior to the lesson. Field corn will be difficult to cut; mature sweet corn will be softer. Do NOT use seed corn because it will have been treated with fungicides to prevent seedling diseases in the field. Frozen corn from the store is fine, but will not show the visual parts as well.
5. This drawing could be used as a handout or as an overhead transparency. Because of space limits, it may be a good idea to blow up the diagrams.
6. Hand out the dot to dot worksheet so the students can complete the diagram of a corn kernel and write in its parts.

*Assessment:*

Students should have a good understanding of the parts of the kernel and their uses.

For more resources and activities: National Corn Growers Association. [www.ncga.com](http://www.ncga.com)

122 C Street, NW, Suite 510

Washington, DC 20001  
(202) 628-7001

#### THE ENDOSPERM

The endosperm is about 82 percent of the kernel's dry weight and is the source of energy (starch) and protein for the germinating seed. There are two types of endosperm, soft and hard. In the hard endosperm, starch is packed tightly together. In the soft endosperm, the starch is loose. When corn dries in the field before harvest, the moisture loss causes the soft endosperm to collapse and form a dent in the top of the kernel, thus the term "dent" corn.

#### THE TIP CAP

The tip cap is the only area of the kernel not covered by the pericarp. It was the attachment point of the kernel to the cob.



#### THE PERICARP

The pericarp is the outer covering of the kernel that protects it from deterioration. It resists water and water vapor and is undesirable to insects and microorganisms.

#### THE GERM

The germ is the only living part of the corn kernel. It contains the essential genetic information, enzymes, vitamins and minerals for the kernel to grow into a corn plant. About 25 percent of the germ is corn oil. Corn oil is the most valuable part of the corn kernel. It is high in linoleic fatty acid (polyunsaturated fat) and has a bland taste.



# THE GRAIN SCAVENGER HUNT

Grades: 2 & 3

Subjects: Reading & Math

Montana Standards: Reading 1 & Math 2

Approximate Time: 2-20 minutes sessions

*Objectives:* Students will

- Recognize food products for each of the five Montana crops.

*Materials Needed:*

- Worksheets a and b for each student
- Grain food products that are not normally part of students' diets (example: cornmeal muffins, soy nuts, whole grain crackers, corn tortillas, tofu)

*Keywords:*

Predominant, ingredients, tofu, grains, soy

*Brief Description:*

Supermarkets are the predominant type of food retailer in the United States. The first supermarket opened in 1930 in Queens, New York. They gained popularity during the Great Depression as they cut costs by allowing customers to select products rather than having a clerk fill the customer's list. Today's supermarkets may have as many as 20,000 food items. Many will contain at least one ingredient made from wheat, oats, sunflowers, corn and barley. This activity will help students see how many different foods contain at least one ingredient from the crops in these lessons.

*Lesson:*

1. Have students read stories about the crops you will cover in this lesson.
  - i. Walter the Baker by Eric Carle
  - ii. The Sleeping Bread by Stefan Czernecki and Timothy Rhodes
  - iii. The Little Red Hen Makes a Pizza by Philemon Sturges
2. Allow students to sample some grain food products that aren't normally part of their diet.
3. Hand out worksheets a and b.
4. Students will need to take the worksheets home and complete them by looking through their pantries and refrigerators or while grocery shopping with a parent.
5. Give students some tips about how to complete the worksheets.
  - Baking aisle—flours, cornmeal, pancake and baking mixes, vegetable oils/shortening, soy milk, corn syrup
  - Product aisle—tofu, soy yogurt, power bars, sunflower kernels, soy nuts
  - Snacks or nuts—crackers, chips, oils, cornmeal
  - Frozen foods—pizza, vegetarian foods
6. Challenge students to locate at least three foods from each of the five crops.
7. Sing the Oats, Peas, Beans and Barely Grow song for fun.

*Discussion Questions:*

- a. What foods have you eaten that were made from these crops?
- b. Have you tried soy products?
- c. What products were made from more than one crop?

*Resources:*

Kansas Foundation for Agriculture in the Classroom

**Worksheet a**

Name\_\_\_\_\_

## Scavenger Hunt

Directions: Look in your kitchen or at the supermarket to find the foods made from, or that have an ingredient made from wheat oats, sunflowers, corn, and barley. Take home the following chart, search and see! Try to find at least three foods or ingredients for each--write down the ingredients or products that are made from each group.

Wheat	Oats	Sunflowers	Corn	Barley

Hints: Check out the baking, cereal, snack food, baked goods, and fruits and vegetable aisles. Read labels!

*Wheat:*  
*flour, bran, semolina*

*Oats:*  
*oatmeal, grain bars*

*Sunflowers:*  
*kernels, oil*

*Corn:*  
*oil, cornmeal, syrup*

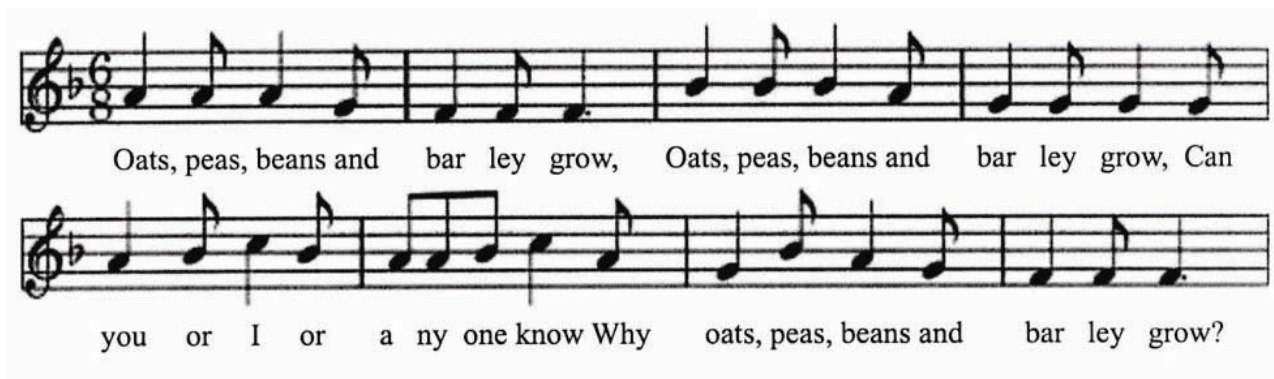
*Barley:*  
*oil*

Name\_\_\_\_\_

## **Scavenger Hunt Questions**

1. Make a bar graph out of your scavenger hunt chart by coloring each column a different color. Number the rows wheat, oats, sunflowers, corn and barley. Which crop was found in the most food? \_\_\_\_\_  
The least \_\_\_\_\_
  2. Write the names of foods or ingredients you have never tried. \_\_\_\_\_
  3. What new food(s) would you like to try? \_\_\_\_\_
  4. Which food products were make from more than one crop?  
\_\_\_\_\_
- 

**Oats, Peas, Beans and Barley Grow**



(Do the motions as you sing)

Oats, peas, beans and barley grows,  
Oats, peas, beans and barley grows,  
Can you or I or anyone know  
Why oats, peas, beans and barley grows?

First the farmer sows his seeds  
Stands erect and takes his ease,  
Stamps his foot and claps his hands  
And turns around to view his land.

(Repeat First Verse)

Next the farmer waters the seeds,  
Stands erect and takes his ease,  
Stamps his foot and claps his hands  
And turns around to view his land.

(Repeat First Verse)

Next the farmer hoes the weeds,  
Stands erect and takes his ease,  
Stamps his foot and claps his hands  
And turns around to view his land.

(Repeat First Verse)

Last the farmer harvests his seeds,  
Stands erect and takes his ease,  
Stamps his foot and claps his hands  
And turns around to view his land.

(Repeat First Verse)

USDA—Ag in the Classroom

# Sunflowers

Grades: 1-3

Subjects: Science

Montana Standards: Science 2-5

Approximate Time: 40 minutes

*Objectives:* Students will

- Identify sunflowers, sunflower seeds, some foods made from sunflowers, and other uses of the plant.
- Demonstrate the basic steps in planting a seed.

*Materials Needed:*

- Sunflower seeds
- Plastic or paper cups
- Potting soil
- Bright lamp or windowsill
- Spray bottle for water
- Sunflower seed snacks
- Scissors
- Glue

*Keywords:*

Pollination, periphery, phenomenon, disease, confectionary, substitute, dampened, excessive, millet

*Brief Description:*

The sunflower (*Helianthus annuus*) is believed to have been domesticated from wild sunflowers around 1000 B.C. in the western United States. The wild sunflower plant is highly branched with small seed heads and small seeds in contrast to the large seed head of the domesticated sunflower. One reason the sunflower is grown so widely is its relatively short growing season, generally requires 90 to 100 days from planting to maturity in the north-central United States, and somewhat longer for longer-season varieties grown farther south.

Sunflower heads consist of 1,000 to 2,000 individual flowers joined together by a receptacle at the base. The large petals around the edge of the head are actually individual ray flowers, which do not develop seeds. Pollination and seed development begin at the periphery of the grain head and move toward the center. It usually takes about 30 days from the time the last flower is pollinated to seed maturity.

A well known sunflower characteristic is that the flowering heads track the sun's movement, a phenomenon known as heliotropism. Most new varieties have heads that droop down to face the ground as the plants mature. This helps reduce damage from birds and from diseases that could occur if water collected in the sunflower heads.

*Uses of Sunflowers*

Food—Most United States production is devoted to the oilseed sunflower, while a smaller percentage is grown for whole-seed confectionary uses, such as candy, snack food, and baked goods. Vegetable oil is the main use for sunflowers grown in the eastern part of Montana. Sunflower oil is considered premium oil due to its light color, mild flavor, low level of saturated fats, and ability to withstand high cooking temperatures.

Ornamental—Many people grow sunflowers in backyard gardens during the warm growing season, both for food and ornamental purposes. In recent years, the sunflower has become extremely popular with gardening enthusiasts, encouraging seed companies to produce a wide selection of sunflowers with ornamental qualities for cut-flower display, and attraction for birds and wildlife.

Birdseed—Another well-known use of sunflower seed is for birdseed, most typically mixed with millet and other grains. The black oilseed varieties are also sold separately, and usually are favored by birds over the striped confectionary seeds. The high oil content of sunflower seeds provides an excellent source of energy for birds.

Livestock—Sunflowers are sometimes used as livestock feed and, in recent years, the chopped stalks have been determined to be a reasonable silage crop.

Industrial—Although the sunflower has the potential for many industrial uses, it is mostly used for food or feed purposes. Sunflower hulls have a limited market for specialty purposes such as poultry litter, fireplace logs, and other high fiber products. Sunflower oil has been researched as a potential diesel fuel substitute.

*Lesson:*

1. Give each student 2 to 3 sunflower seeds in a small container. Have them examine the seeds carefully. Ask what they will need to plant the seeds.
2. Pour a small amount of soil onto each student's desk or into his or her hands.
3. Have students describe the soil. What is it made of? What color is it? How does it smell?
4. Pass out planting containers with drainage holes and have each student write his or her name on the containers.
5. Have students fill the containers almost to the top with dampened soil. Provide spray bottles of water to moisten the soil.
6. Have students poke a hole for each seed about one inch deep into the soil, place a seed in each hole and cover it lightly with soil.
7. Place the pots on a tray in a sunny window or under a lamp and water them when soil is dry to the touch.
8. Check containers daily to avoid excessive drying if placed near a heating device or in the hot sun.
9. In 5 to 10 days plants will emerge in each container. If more than one seed germinates, have students carefully cut out all but the healthiest plant.
10. Hand out worksheet a. Have students color the pictures, cut them out, and paste them in the proper order to complete the cycle.
11. Hand out worksheet b. Have students color the pictures, cut them out and use as sequencing cards.

*Extension:*

12. Shell and eat some sunflower seeds from the grocery store. Remember that seeds for planting may have been treated with pesticides. Do not eat treated seeds! Purchase only seeds that have not been treated.
13. Have students make calendars to keep a record of their plants' development.
14. Take pictures of plants daily, especially during the seed germination period. Show pictures of sunflowers from seed catalogs, magazines, etc...
15. Have students look at home for sunflower products or other seed products.
16. If possible, take a field trip to a greenhouse, farm, or landscape nursery that grows and/or sells sunflowers.

*Resources:*

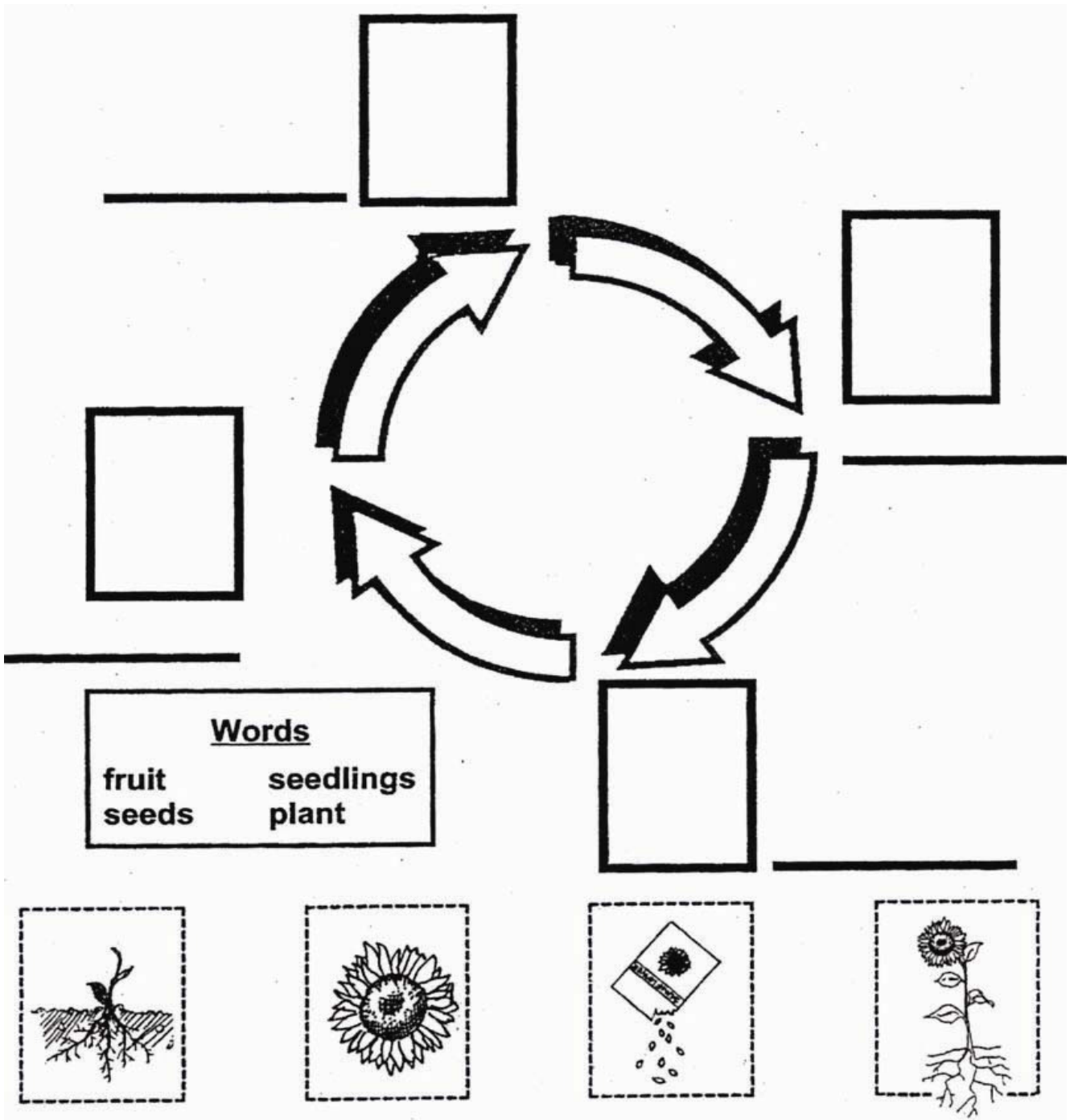
Oklahoma Agriculture in the Classroom, Oklahoma State University, Department of Agricultural Education

Name \_\_\_\_\_

Worksheet a

## **Here Come the Sunflowers!**

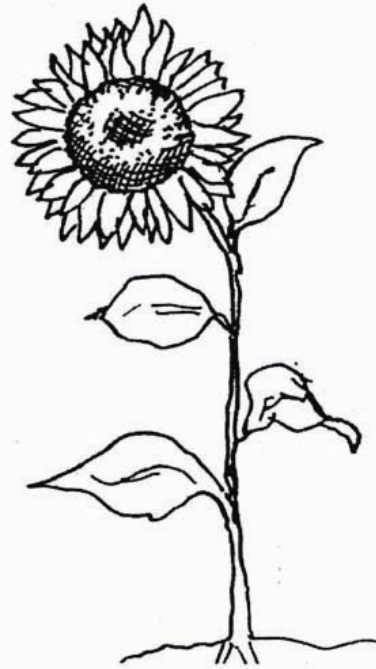
Cut out the pictures at the bottom of the page. Paste them in order in the boxes to complete the cycle. Then write the correct word in the space provided.



Name \_\_\_\_\_

Worksheet b

**Here Come the Sunflowers!**



## HOW SWEET IT IS

Grades: K-3

Subjects: Reading and Science

Montana Standards: Reading 1-4, Science 2-5

Approximate Time: 2-30 minute classes

*Objectives:* Students will

- Become familiar with how sugar beets grow.
- Demonstrate knowledge of keywords
- Become aware of by-products of sugar beets
- Be familiar with the sugar beet process

*Materials Needed:*

- “Sweet Words” word search
- “Sweet Crop” crossword puzzle
- Extracting sugar from sugar beets flow chart
- Sugar Beet diagram
- Beet Sugar Progress sheet
- Bags of sugar

*Keywords:*

Roots, stem, leaves, crown, pulp, molasses, syrup, hopper, cossettes, evaporate, crystallized

*Brief Description:*

Sugar beets are second only to sugar cane for sources of sugar. Montana ranks 6<sup>th</sup> in the nation in sugar beet production. In 1999, 1,468,000 tons of sugar beets were harvested in Montana. Most sugar beets are grown in south central Montana.

Sugar beets are grown from a seed, which produces a root, stem and leaves. The actual sugar beet is the root, which contains many cells. Large cells contain water, while small cells contain the sugar.

Sugar beet fields are easily mistaken for a field of potatoes. Above the ground they appear as only greens. Underneath lies the beet, which is light tan, also like a potato. However, sugar beets are more closely related to a red garden beet.

The crown or stem, is used to feed cattle, sheep and hogs. The pulp that is left after the sugar is taken out and can also be eaten by animals. Dried beet pulp is the dried fiber residue left after most of the sugar has been extracted. It can be produced and shipped in many forms: plain dried, molasses, dried and pelleted. It is primarily used by dairy farmers, as it caused the cow to produce more milk. Many sheep and cattle producers also use beet pulp to feed their animals. Another by-product is beet molasses. It is used for production of yeast, chemicals, medicine, and as a sweetener for cattle feed.

To extract the sugar from the beet, the beets are washed and cut into thin slices (cossets). These slices are put in hot water, which soaks the sugar out and forms a syrup. The syrup is then purified, filtered and boiled again. Finally it is dried to sugar, which is packaged and marketed.

*Lesson:*

1. Introduce children to the bag of sugar
2. Read introduction
3. Show and explain sugar beet diagram
4. Read “Sugar Beet Process”
5. Review “Extracting sugar from sugar beets” flow chart
6. Handout “Sugar Beet” word search / “Sweet Crop” crossword puzzle

Additional Resources and Information:

Montana States Beet Growers, Rt. 2, Box 3078, Forsyth, MT 59327

Holly Sugar Corp., Box 1168, Sidney, MT 59270

Videos: Montana Country – We Grow These Too!, AMS Treasure Chest

## **Beet Sugar Process**

1. The sugar beets are harvested from the field and taken in trucks to the beet factory.
2. They are dumped into a wet hopper and float through the factory in a tube filled with water. On the way through, they are cleaned by moving through a rock and crash catcher (for weeds and leaves). They are further cleaned by a sprayer.
3. The beets are fed from the hopper into the slicers, where they are cut into strips, or cosettes. These cosettes fall onto a conveyor belt to be weighed and thrown into a tank. Here the sugar is removed by dissolving the beets in hot water. When the cosettes reach the opposite end of the tank they are beet pulp.
4. The beet pulp moves to the pulp dryer. The raw juice moves through purification and filtration to remove impurities and other non-sugars.
5. After it has gone through purification, it is in two forms: thick juice and thin juice. The thin juice must be sent through heaters and to an evaporation station. After evaporation, it is now thick juice.
6. This thick juice is boiled and crystallized to a high concentration of sugar, called massecuite. The massecuite is spun which separates the sugar crystals from impurities. The spun sugar then drops to a conveyor belt to go to the granulator for further drying and cooling. The finished sugar passes over sifters and moves on to the sugar bins for storage, or to the warehouse for packaging.
7. Other sugar, along with important by-products still remain in the syrups and washwater. It is sent back through the process. The pulp (dried cosettes) meanwhile has been further dried and squeezed in presses. This squeezing compacts the pulp into pellets so it can be handled more easily. It moves to the pulp warehouse.

## “SWEET WORDS”

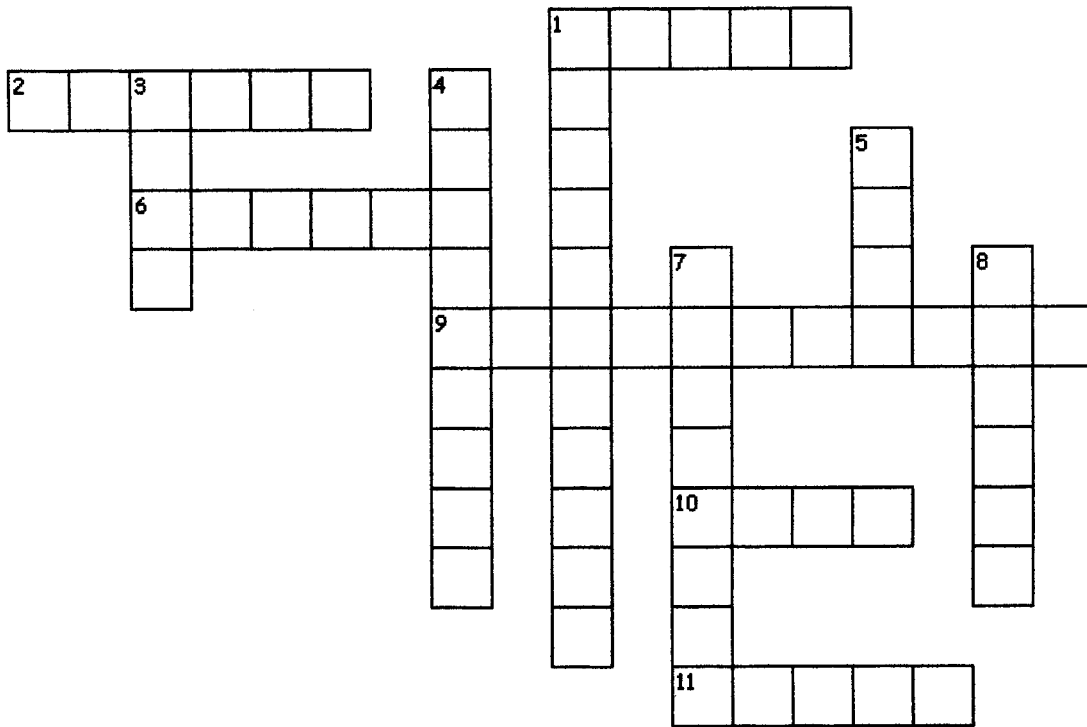
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D M Y P C S L H O S O L A W M  
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P Z T X U D F F E T D W G G U  
U P I L B K D I Q L E F A K L  
C R Y S T A L I Z E D S N X P  
R O O T N Q T P J G K F D N I

COSSETTES  
EVAPORATION  
MOLASSES  
ROTATE

CROWN  
HOPPER  
PULP  
STEM

CRYSTALIZED  
LEAVES  
ROOT  
SYRUP

# SWEET CROP



## Across

- d. another word for stem
- e. tank holding water
- 8. flat green outgrowth of a plant
- 9. to drive out the moisture from heat
- 10. main stalk of a plant
- 11. thick solution of sugar and water

## Down

- a. solid clear substance
- 3. what is left after the sugar is taken out
- 4. strips of sugar beets
- 5. the actual sugar beet
- 9. thick brown syrup
- 8. to alternate crops

# FROM FLOUR TO TORTILLAS

Grades: K-2

Subjects: Science, Language Arts, and Health  
Montana Standards: Literature 1, Science 2,  
Health Enhancement 1

Approximate Time: 3 days

*Objectives:* Students will

- Become familiar with the process of growing of wheat
- Experience grinding wheat into flour
- Make and enjoy eating tortillas

*Materials Needed:*

- Wheat grinder
- Enough wheat to have 1 ½ cups flour for each group of 4 students
- I Wonder How Bread Is Made by Neil Curtis and Peter Greenland in AMS Library
- Recipe and ingredients for tortillas

*Keywords:*

Tractor, combine, plow, field, harrow, drill, sprout, harvest, straw

**Brief Description:**

Wheat is one of Montana's largest crops. Montana wheat is used as livestock feed or made into flour for foods like bread, cakes, cookies, crackers, and pretzels. Our wheat is also used for non-food items such as glue and pharmaceuticals. The farmer plants the tiny wheat kernels (another name for seeds) in the ground using a grain drill. The seed germinates (sprouts) and begins to grow into a plant, which consists of roots, a stem, long, slender leaves, and a head, which has kernels.

In August or September, the farmer combines or harvest the wheat and unloads the combine hopper into trucks or wagons. The farmer will haul the wheat to the local elevator. An elevator has giant silos to store grain. The farmer receives payment for his wheat, and then the elevator ships the wheat by truck or rail to a grain terminal. Next, the wheat is sold to various industries, which make food or feed, or for shipment overseas.

The place where wheat is shipped to make flour is called the mill. The people who process the wheat are called millers. The wheat is put through a cleaning process to remove foreign matter (weed seeds, corn seeds, beans, stems). Rollers then press over the wheat kernels to break them into pieces, and they are shaken on screens to sift out the bran (the broken coat of the kernel) and germ (the part of wheat used to grow a new plant) not used in wheat flour. This is repeated three times to make a soft powdery substance we know as flour. If whole wheat bread is what the mills wants to make, the bran and germ are added back in. Next the miller adds a special ingredient to the flour to whiten it, along with B-vitamins and iron for nutrients. The flour is shipped in bags to the bakery or to the grocery store. There are several types of wheat. For example hard red winter wheat has high protein and is used for bread flour and hard rolls. Hard red spring wheat has high protein and is used for bread flour and yeast breads. Soft red winter wheat has low protein and is used in pastries and crackers. Finally, Durum has low protein and is used in lasagna, spaghetti and macaroni.

Bakers like to use wheat flour because it contains a magical protein called gluten. To make bread dough, active yeast, warm water, and other ingredients are added to the flour. The gluten traps the air bubbles the yeast releases and causes the dough to raise.

Early elementary children may find the story, *The Little Red Hen* helpful in illustrating the process of turning wheat into bread.

This lesson will show the students the process from growing the grain to the finish product.

*Lesson:*

1. Read and discuss, through page 15, the book I Wonder How Bread Is Made. Explain to the students that the wheat they will be grinding will be used for the tortillas.
2. Grind the wheat kernels into flour.
3. Make tortillas in a bag.

*Assessment:*

Students made the connection of how grain is grown to produce the flour and the flour is taken and made into food products such as tortillas.

## **MAKE TORTILLAS IN A BAG**

### **FLOUR TORILLAS**

1 ½ cups all-purpose flour

1 teaspoon salt

½ teaspoon baking powder

3 tablespoons shortening (shortening is available in sticks and is easier to use in this form)

½ cup hot water (125-130°F)

In a large plastic bag combine flour, salt, and baking powder. Close bag and shake to mix.

To the ingredients in the bag, add the shortening. Close bag with twist tie and work mixture with fingers until the ingredients form soft dough that pulls away from the sides of the bag.

Add the hot water to the bag. Close the bag and mix with fingers until the ingredients form soft dough hat pulls away from the sides of the bag.

Turn the dough out onto a lightly floured surface. Divide dough into 4 equal pieces and shape into balls. Each child receives two balls. Cover them with the plastic bag, and let rest for 15 minutes.

Roll or pat the dough into 8 to 10-inch circles. Place each circle on a griddle or frying pan, heated to medium high. Cook until dark brown spots appear. Turn tortilla and cook on the other side until brown.

Want a quick meal? Roll up a tortilla with cheese, salsa and fat-free refried beans. “OR...make a fun dessert, sprinkle with cinnamon and sugar on top roll up and eat, OR...add pie filling for a tasty treat.”

# THE KERNEL SPROUTS

Grades: K-2

Subjects: Science and Math

Montana Standards: Science 1 & 2, Math 1 & 2

Approximate Time: 1 week

*Objectives:* Students will

- Discovering that one kernel of wheat produces many kernels
- Observe and document a kernel sprouting

*Materials Needed:*

- Stalks of wheat for each 2 children
- Picture of combine and truck or if possible a toy replica of each
- Jewelry size zip-lock bags
- Yarn for necklaces
- Strip of paper for each student approximately 5 ½ x 17
- Water hydrating crystals

*Keywords:*

wheat- a grass that belongs to the cereal grains, sprout, kernel, combine, roots

*Brief Description:*

Observing and journaling process of sprouting a kernel of wheat.

*Lesson:*

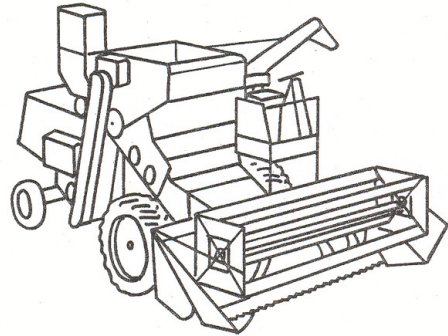
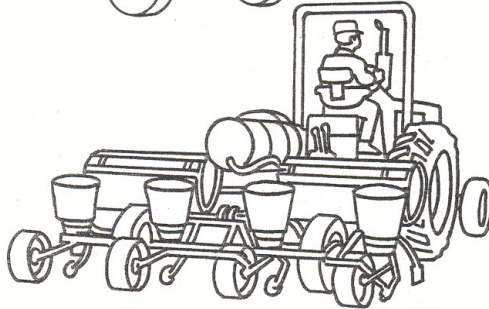
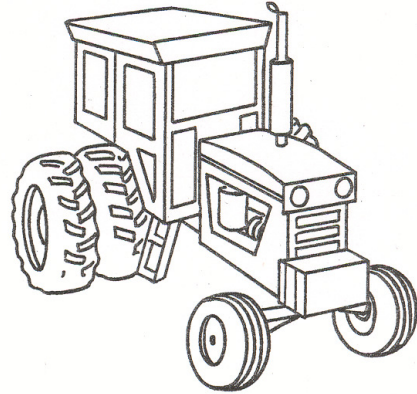
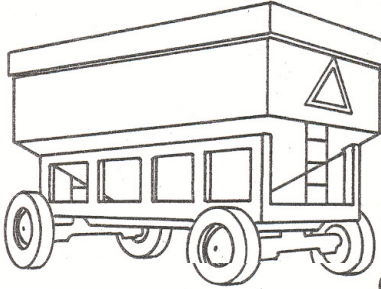
1. Give each pair of children a stalk of wheat. Have children break off stem. Explain that the stem is straw. Have children take turns rolling the head in their hands. Separate wheat kernel from chaff. Read numbers and estimate how many kernels most heads had. Count the kernels and record the numbers on a large kernel of wheat. Show poster or toy combine and truck and explain that what the children just did is the job a combine on the farm does.
2. Make sprouting bags. Teacher can squirt several drops of food coloring into a pint of water. Each child receives one kernel of wheat, 3 or 4 water crystals, 1 small jewelry size zip-lock bag (with hole punched above the seal) and 3 or 4 drops of colored water. Zip the bag shut and thread yarn through to make a necklace. The necklace could be worn every day throughout the week. **They should be left at school.** Begin this activity on Monday to be able to journal throughout the week.
3. Fold 5 ½" x 17" strip of paper into fourths to make a book. Label cover with a title and glue on a kernel of wheat. Number the pages 1-5. Each day of the week observe, discuss, and journal by drawing or writing a few words. By the end of the week the kernel should have roots and a green sprout. Send home at the end of the week.

*Assessment:*

Reading and understanding the picture journal.

# M

is for **machine**. A farmer uses many kinds of **machines** to grow corn, soybeans, and wheat. draw a line to match the name of each **machine** with what it does.



Tractor—pulls other **machines**  
Planter—plants seed into the soil  
Combine—harvests crops  
Wagon—carries crops

Read the word below. On a sheet of paper print the word.

## machine

# WHEAT DETECTIVE ON THE TRAIL

Grades: K-2

Subjects: Language Arts and Math

Montana Standards: Reading 4, Writing 4, Math 2

Approximate Time: 2 days

*Objectives:* Students will

- Become aware that many, many products we eat have wheat flour as a primary ingredient.
- Categorize wheat flour based foods according to the following possible categories:

pasta	cereals	breads
desserts	fast foods	

*Materials Needed:*

- Food containers with wheat as a major ingredient
- Large paper for food chart

*Keywords:*

Ingredients, wheat, flour, products

*Brief Description:*

We will be making children more aware that wheat is a major ingredient in many of the foods that are eaten on a daily basis around the world.

*Lesson:*

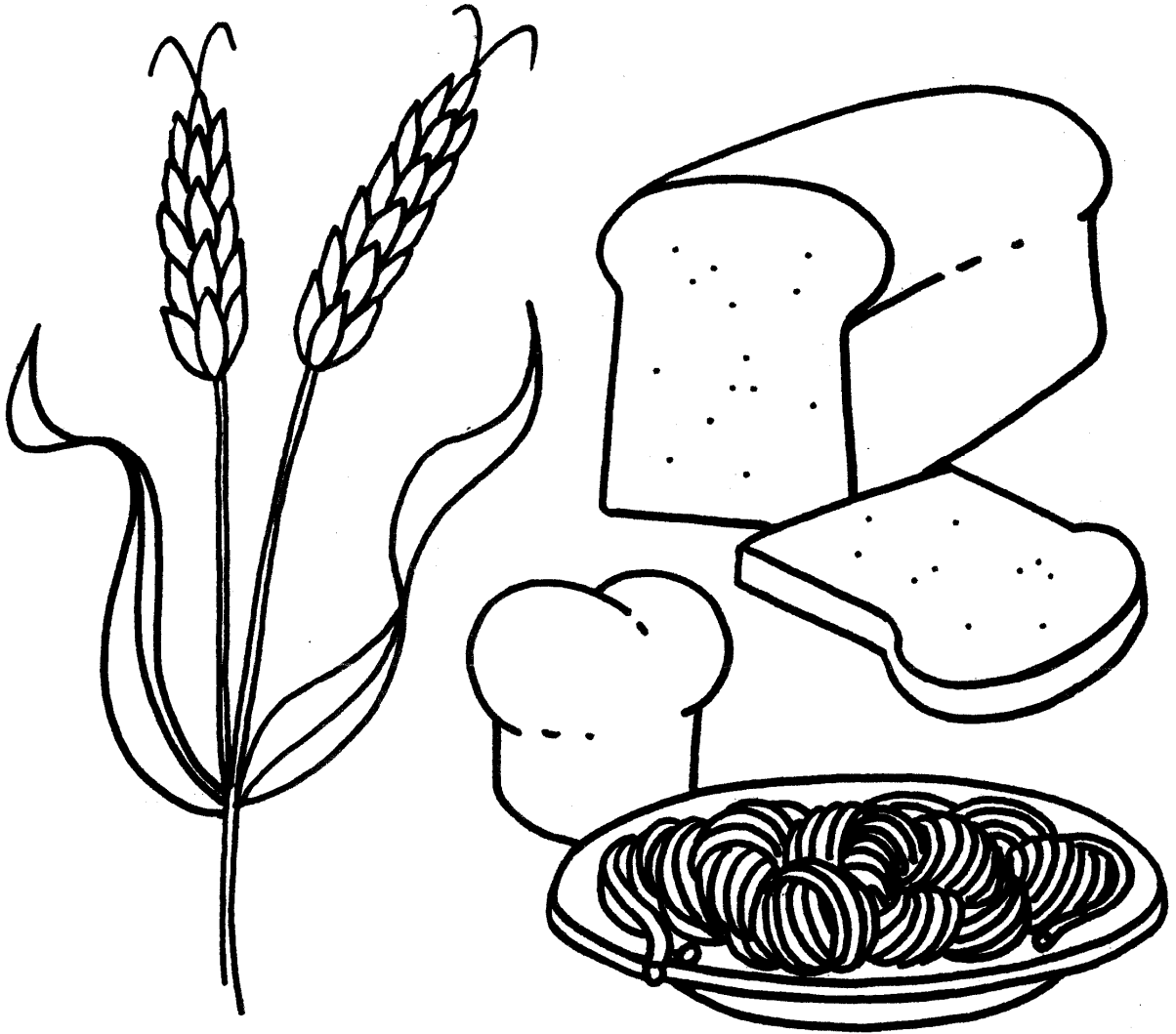
1. Teacher displays a box of crackers, loaf of bread, box of cereal, pizza box, box of spaghetti, and a cake mix (for example). The teacher explains to the students that a major ingredient in each of these foods is wheat flour. Teacher displays a chart with the following possible headings (pasta, desserts, cereals, fast foods, and breads). Brainstorm, with students, foods that will fit into each category. Ask students to bring empty containers (box, can, or bags) from home the following day of food products with wheat flour as an ingredient.
2. Chart the food containers that the students brought from home. Use the same categories as were used the first day. Kindergarteners could place their food containers in the appropriately labeled areas.

*Assessment:*

Have students complete The Western Wheat Kids worksheet and the W is for Wheat worksheet. For older students, have them write three wheat flour products that can be eaten for breakfast, lunch, dinner, and snacks. For fun, students may complete the dot-to-dot sheet titled Grain Based Food.

# W

is for **wheat**. Many farmers grow **wheat** in their fields. **Wheat** is made into flour. Flour is made into food like bread, cakes, pancakes, muffins, and spaghetti.



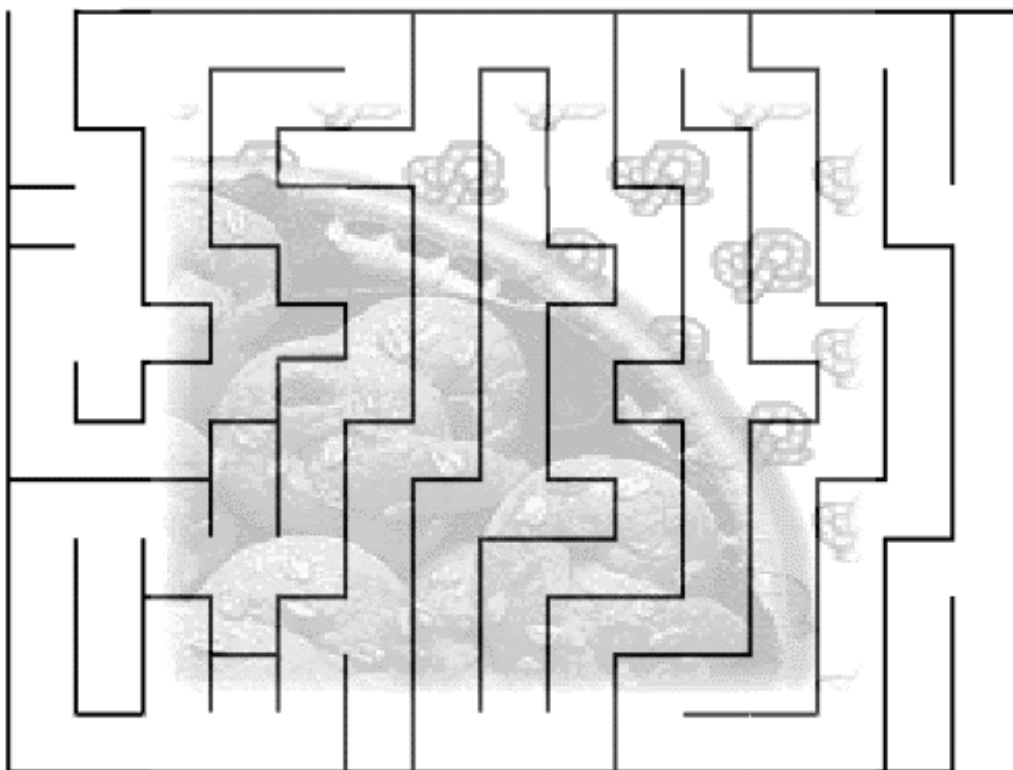
Read the word below. Then print the word.

wheat

Start



Help the twins find their healthy,  
wheat food snack!



FINISH



Compliments of the  
MONTANA WHEAT & BARLEY COMMITTEE  
750 6<sup>th</sup> Street SW ▪ Great Falls, MT 59403 ▪ (406) 761-7732